



REPORT
ON
MINOR IRRIGATION WORKS
IN
RAJASTHAN STATE

COMMITTEE ON PLAN PROJECTS
(Irrigation Team)
NEW DELHI
July 1965

LETTER OF TRANSMITTAL

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Leader,

Irrigation Team.

Link House,
3, Mathura Road,

New Delhi.

July 26, 1965.

My Dear Nanda Ji,

I have pleasure in forwarding herewith the report of the Irrigation Team on the study of minor irrigation works in Rajasthan State. Rajasthan is mostly an arid and water deficient region. Apart from the Rajasthan Canal Project, possibilities of large irrigation schemes in the State are limited. Small irrigation works, therefore, occupy a significant place in its agricultural economy.

The Team made field studies of several small irrigation schemes in different parts of the State, and their findings are discussed in detail in the report. Utilisation of irrigation potential was generally found to be below targets. Practical suggestions to improve the position as emerged out of the study have been made and the views of the Team have, in general, been accepted by the State authorities.

Some important recommendations of the Team are:—

- (i) to achieve optimum agricultural production per unit of water as well as land; commands, outletting system and regulation and rostering of channels and water rates on the existing minor irrigation schemes need to be reviewed so as to ensure equitable distribution of the scarce water supplies;
- (ii) to bring in areas located in erstwhile princely States under a uniform Irrigation Code and procedure with a view to ensure their efficient control and performance; and
- (iii) to develop, propagate and demonstrate new cropping patterns depending on irrigation facilities being made available.

Recently introduced dual control by Irrigation and Revenue authorities exercised on tanks and reservoirs irrigating from 51 to 2500 acres appears to be leading to a lag in their efficient performance. The matter, therefore, needs to be re-considered by the State Government.

Also care has to be exercised before launching on an expansionist programme of small irrigation works to guard against depletion of meagre water yield from natural surface and sub-surface sources to the existing irrigation works, more particularly in the western half of the State.

(ii)

I take this opportunity of expressing our thanks to the officers of the State Irrigation and Agricultural Departments from whom we received full co-operation in our studies.

With best regards,

Yours sincerely,

M. THIRUMALA RAO

Shri G. L. Nanda,
Minister for Home Affairs
Government of India,
New Delhi.



P R E F A C E

Study of Minor Irrigation Works in Rajasthan State was taken up by the Irrigation Team, Committee on Plan Projects, Planning Commission in accordance with the Terms of Reference communicated *vide* Committee on Plan Projects Memorandum No. COPP/(4)/17/58, dated the 4th August, 1958 given in *Appendix I* of this report.

The Team comprised:—

- | | |
|---|-------------------|
| (i) Shri M. Thirumala Rao, M.P. | Leader |
| (ii) Shri Baleshwar Nath,
Chief Engineer. | Member |
| (iii) Dr. Arjan Singh,
Retd. Director of Agriculture,
Punjab. | Member |
| (iv) Shri Mahavir Prasad,
Irrigation Adviser,
Ministry of Food and Agriculture. | Member—Ex-Officio |

After preliminary discussion on September 23, 1963 at Jaipur and September 24, 1963 at Udaipur (Minutes appear in *Appendices II* and *III*) field studies were initiated by the Leader. The Team subsequently toured different parts of the State, and conducted at-site studies of representative Irrigation works of both pre-Plan and post-Plan periods.

The studies conducted primarily aimed at techno-economic appraisal of the works as also of their maintenance, irrigational performance and overall benefits accruing to the community.

The Team has had discussion with State authorities at appropriate levels on different aspects of small irrigation schemes in the State. Accompanied by the Leader of the Team, a visit was paid to Bourunda wells in Jodhpur area, and later the Team visited representative works in Bikaner, Udaipur, Ajmer, Alwar, Bharatpur and Kota regions.

Various issues as emerged out of the field studies were discussed concurrently with State authorities. Eventually a draft report was forwarded to the State Government for their comments *vide* letter No. COPP/IT/M/65/56 dated March 24, 1965. The State authorities have expressed their general concurrence with the views and recommendations of the Team (*Appendix VI*). This report thus reflects more or less agreed views of the Team and the State Government.

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CHAPTER I

GENERAL

1.1. Rajasthan, in terms of area, is the second largest State in India. It extends between $23^{\circ} 3'$ and $30^{\circ} 12'$ north latitudes and $69^{\circ} 30'$ and $78^{\circ} 17'$ east longitudes. Area of the State is about 132 *lakh* sq. miles. It is adjoined by the Punjab and Uttar Pradesh on north and north-east, Madhya Pradesh on south-east and Gujarat on south-west (Figure 1.1).

1.2. Rajasthan as constituted now is an amalgam of a number of princely States and chiefships which merged into Indian Union between the year 1948 and 1956. It also included the erstwhile territory known as Ajmer-Merwara. It therefore, represents varying cultures and historical backgrounds and equally varying is its agro-economic picture.

PHYSICAL FEATURES

1.3 Aravalli range of hills intersects the State diagonally from south-west to north-east, extending right upto Delhi. It forms the watershed line between catchments of streams flowing into Arabian Sea and Bay of Bengal respectively. It has a steep but discontinuous front to the Thar plains in the west and a relatively gentle slope to the alluvial basins in the north and the east. Mount Abu is the highest point of the range. It attains a height of 5,646 ft. above M.S.L. A chain of spurs and carving ridges averaging to heights of 3,500 ft. to 4,000 ft. surround Udaipur region.

1.4. An important basin of interior drainage is that of Sambhar lake. It occupies an area of about 90 sq. miles. It is the major source of salt in North India.

1.5. Desert and semi-desert wastes of the Thar occupying large areas of Bikaner and Jodhpur, Jaisalmer districts stretch to the west of Aravallis. The monotony of the extensive sandy plains is broken by isolated patches of scrubby and stunted vegetation. There are also numerous hillocks of small elevations dotting the desert.

1.6. The lower area in the south-east of the hill range is an elevated plain forming the Western Plateau. The districts of Chittorgarh, Kota, Bundi and Jhalawar roughly constitute this Plateau. North-eastern and central parts of this tract are more alluvial while the south-eastern part has thin soil and is slightly rocky.

RAINFALL

1.7. Annual precipitation in Rajasthan varies from 35 inches in the south-east to 20 inches in the west in the sub-humid part of the State comprising the Aravallis and the alluvial plains at its foot. In the semi-desert area lying between the Aravallis and the Thar annual precipitation is 20 to 10 inches, and it comes down to only 5 inches in the Thar desert. The 20 inches annual iso-hyetal line (Fig. 1.2) is the critical dividing line between the Thar desert and semi-desert area in the west and sub-humid area with irrigated agriculture in the east.



ILLUSTRATIONS

INTERNATIONAL BOUNDARY	— · — · — ·
STATE BOUNDARY	—————
DIVISIONAL BOUNDARY	- - - - -
DISTRICT BOUNDARY	.....
STATE CAPITAL	⊙
DISTRICT HEADQUARTERS	●

Fig. 1.1—Physical Map of Rajasthan.

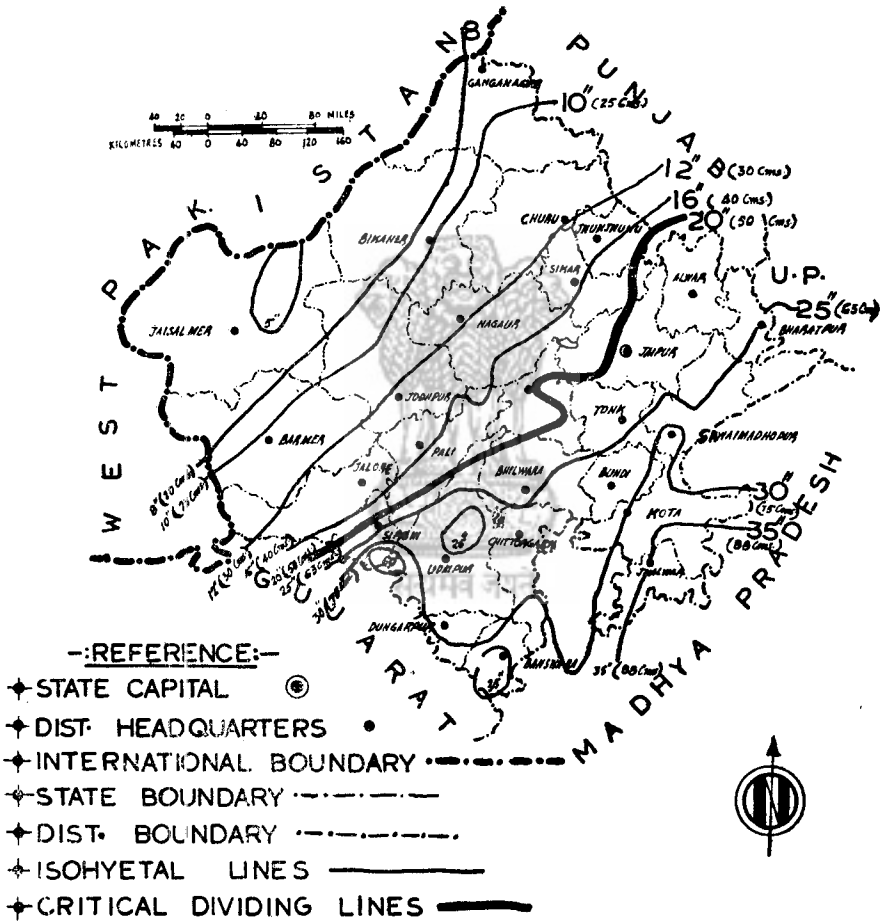


Fig. 1.2—Isohyetal Map of Rajasthan.

Table 1.1
Mean Rainfall (R) in inches and Number of Rainy Days (D)

Station	Jan- uary	Feb- ruary	March	April	May	June	July	August	Septem- ber	October	Novem- ber	Decem- ber	Total of the year
Ganganagar	R. 0.26	0.44	0.21	0.20	0.24	1.22	2.69	2.78	0.27	0.06	—	0.21	8.58 or 21.8 cm
D.	0.9	1.4	0.7	0.7	0.7	0.9	3.6	3.7	0.7	0.2	—	0.8	15.2
Bikaner	R. 0.27	0.27	0.23	0.19	0.59	1.21	3.34	3.60	1.21	0.21	0.05	0.20	11.47 or 29.5 cm
D.	0.8	0.7	0.6	0.5	1.3	2.2	4.9	4.9	2.1	0.4	0.1	0.5	19.0
Jodhpur	R. 0.15	0.24	0.11	0.13	0.41	1.42	3.97	4.84	2.40	0.32	0.11	0.11	14.21 or 36.19 cm
D.	0.3	0.6	0.2	0.5	1.1	2.1	5.5	5.9	2.8	0.5	0.2	0.3	20.00
Barmer	R. 0.10	0.14	0.12	0.06	0.37	0.97	3.52	3.41	1.46	0.10	0.05	0.07	10.37 or 26.33 cm
D.	0.3	0.8	0.3	0.2	0.6	1.5	4.2	8.3	2.2	0.2	0.2	0.2	14.5
Jaipur	R. 0.44	0.32	0.34	0.17	0.57	2.24	7.74	8.06	3.22	0.43	0.14	0.30	24.02 or 61.0 cm
D.	1.0	0.8	0.9	0.5	1.6	3.9	10.3	10.2	4.7	0.7	0.3	0.7	35.6
Sikar	R. 0.36	0.33	0.30	0.11	0.64	1.84	4.99	5.80	1.93	0.24	0.14	0.27	16.95 or 43.15 cm
D.	1.0	0.9	0.9	0.5	1.7	3.2	7.4	8.0	3.4	0.6	3.3	0.6	28.5
Udaipur	R. 0.20	0.14	0.10	0.11	0.72	3.04	8.55	7.01	0.57	0.57	0.11	0.11	21.23 or 53.9 cm
D.	0.4	0.5	0.3	0.2	1.5	4.6	10.4	8.6	1.1	0.3	0.3	0.3	38.6
Ajmer	R. 0.37	0.26	0.23	0.15	0.64	2.43	6.41	6.75	2.70	0.38	0.19	0.26	20.77 or 52.8 cm
D.	1.0	0.7	0.7	0.4	1.5	2.7	8.9	8.4	4.0	0.7	0.4	0.4	29.8

1.8. The general rainfall pattern of the State is, however, highly variable with a vulnerability of frequent droughts. About 90 per cent of the annual precipitation occurs during the monsoon period *i.e.* from June to September. The State has a net work of 12 observatory stations and about 240 raingauge stations for which records of rainfall are maintained. The mean monthly and annual rainfall and the mean number of rainy days for some important stations are given in Table 1.1.

CLIMATE

1.9. Rajasthan, on the whole has extremes of climate. Mercury touches 48°C (118°F) or more in summer and comes down to freezing point at certain places in winter.

1.10. The weather in summer is dominated by hot westerly or southeasterly winds and sand storms in the western part of the State. Due to the sandy nature of the soil, which rapidly gets heated during the day and cools down quickly after dusk, variations of as much as 22°C is noted in the maximum and minimum temperatures.

POPULATION

1.11. As per census of 1961 population of Rajasthan is 2,01,55,602 whereas, it was 1,59,70,774 in 1951. There is thus an increase of 26.20 per cent (2.62 per cent per annum) compared to the all India increase of 21.50 per cent in this decade. Density of population per sq. mile in Rajasthan is lowest amongst the States of Indian Union. It is 153 against 370 for India. Due to desert and semi desert conditions and lean rainfall, Rajasthan is a sparsely populated State.

STATE INCOME

1.12. Revenue accruing to the Exchequer of a State from the various sources gives an idea about the structure and growth of its economy. Rajasthan State income in the year 1960-61 (at 1957-58 price level) given below indicates that more than half (52.80 per cent) of the total income is the contribution of the agriculture sector. Mining industry and other secondary activities yielded only 14.08 per cent and the tertiary activities brought in the remaining 33.12 per cent.

Sector	State income in 1960-61 (crores of Rs.)	Percentage of the Total
1	2	3
Agriculture and allied activities	296.48	52.80
Mining and secondary activities	79.08	14.08
Tertiary activities	185.99	33.12
GRAND TOTAL ..	561.55	100.00

Thus, Rajasthan being predominantly an agricultural State, needs strengthening of its agricultural sector to secure relatively stabilised economy. To achieve as much immunity against the vagaries of nature as possible, provision of more assured irrigation potential needs to be examined along with maximising utilisation of the existing potential and propagation of dry farming techniques,

SOIL

1.13. Basically, soils of Rajasthan form a part of the Indo-Gangetic plain. On the North-west of the Aravalli range the area is sandy and barren. From a mere desert on the Sind border with isolated hills and rock out-crops at places, soils gradually improve in fertility towards east and north-east. They could broadly be categorised as under—(Figure 1.3).

<i>Area</i>	<i>Nature of soil</i>
1. Desert districts of North-west.	Sandy. Usually saline or alkaline with unfavourable physical condition and high pH value. Water is scarce and occurs at great depths varying from 100 to 400 feet from ground level. Due to excess of salt, some wells do not yield potable water.
2. Ajmer area.	Sandy. Clay content varies between 3 and 9 per cent. There is absence of calcium carbonates and the salt content is low.
3. Jaipur and Alwar area.	Loamy sand to sandy loam. The pH value is neutral to alkaline. Water soluble salt content is usually normal for crop growth. Organic carbon and available nitrogen is low.
4. Kota, Bundi and Jhalawar area.	Black to light black and deep. The pH varies from neutral to alkaline. The texture varies from loam to clay loam. Organic carbon and available nitrogen and phosphates are low to medium.
5. Udaipur, Chittorgarh, Banswara and Bhilwara tract.	Eastern part of the tract has mixed red and black soils and the western part has red and yellow soils. The pH value is neutral to slightly alkaline. Total soluble salt content is normal with a few reaching critical limit. Organic carbon and available nitrogen are usually low.

There are quite a large number of irrigation tanks throughout the State which get filled up during the monsoon. They have, however, clayey loam beds and emergent areas are used for growing wheat and gram in *rabi*.

AVAILABILITY OF WATER

1.14. Low and erratic rainfall, and light and sandy soils which allow easy percolation are the limiting factors of available water in Rajasthan. The rivers running in flat areas and flowing mostly in the rainy seasons do not generally provide suitable storage sites.

1.15. Total run-off of water in the State is estimated at 23,53,000 million cubic feet. There is practically no run-off in the arid zone.

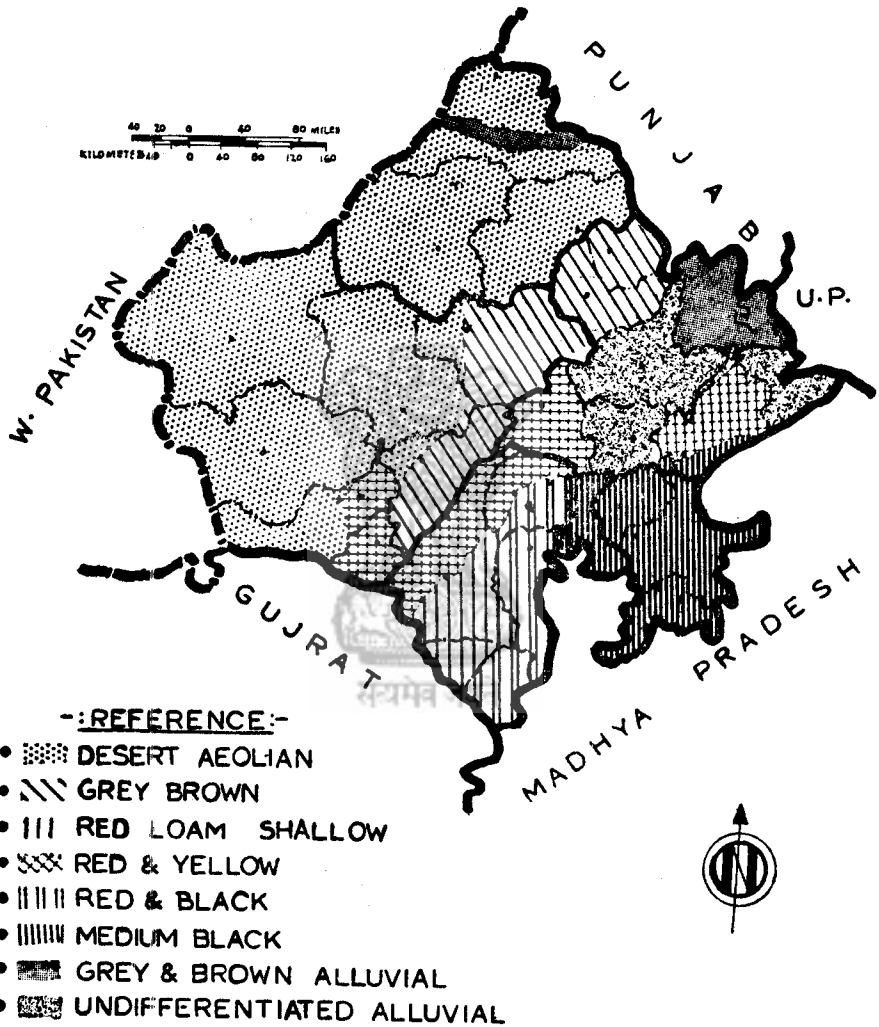


Fig. 1.3—Soil Map of Rajasthan.

1.16. Total area irrigated in Rajasthan through various sources in the year 1961-62 was 45,05,000 acres out of total cropped area of 3,71,78,000 acres which works out to about 12 per cent. Source-wise details compared to All India figures* is indicated below—

Source of Irrigation	Rajasthan		All India		Percentage of State's figures compared to All India figures
	Area (acres)	Percentage	Area (acres)	Percentage	
1. Canals—					
(i) Govt. canals	14,36,000	31.87	2,30,77,000	42.26	5.54
(ii) Private canals	Nil		28,27,000		
Total	14,36,000		2,59,04,000		
2. Tanks ..	5,30,000	11.76	1,12,18,000	18.35	4.72
3. Wells ..	24,15,000	53.60	1,80,37,000	29.50	13.39
4. Other sources	1,24,000	2.77	59,89,000	9.89	2.07
Total	45,05,000	100	6,11,48,000	100	7.37

It will thus be seen that the contribution of surface wells towards the irrigated agriculture in the State is maximum, viz., 53.60 per cent, while the corresponding figure for the entire country is only 29.50 per cent.

AGRICULTURE

1.17. With about 70 per cent of the State population being engaged in agricultural occupation, the economy of Rajasthan is predominantly agricultural. Area under various crops, production and yield in the State for the year 1962-63 is given in the Table 1.2.

Table 1.2

Name of the crop	Area ('000 acres)	Production ('000 Tons) (Lbs.)	Average yield/acre	
			Rajasthan (Lbs.)	All India (Lbs.)
1	2	3	4	5
Rice ..	280	99	792	821
Jowar ..	2,900	407	314	469
Bajra ..	10,162	930	205	322
Maize ..	1,715	750	980	881
Small millets ..	170	26	343	351
Wheat ..	3,071	1,068	779	738
Barley ..	1,197	523	979	727
Total—Cereals ..	19,495	3,803	437	655

*Source—Directorate of Economics and Statistics, Provisional figure for 1961-62,

TABLE 1.2 (*contd.*)

	1	2	3	4	5	
Gram	3,667	733	448	556
Tur	62	10	361	581
Other pulses	4,259	441	232	335
Total—Pulses	7,988	1,184	332	447
Total—Food grains	27,483	4,987	406	613
Groundnut	446	85	427	617
Castor seed	6	1	373	206
Sesamum	1,530	79	116	167
Rapeseed and Mustard	791	130	368	371
Linseed	271	27	223	202
Total oil seeds	3,044	322	237	422
Sugarcane	80	810	22,680	35,636
Chillies	59	21	797	557
Cotton	478	160*	131	106

Source—Final Estimates of Area, Production and Yield, Directorate of Economics and Statistics.

*In thousand bales. (400 lbs.)

1.18. It will be seen that the yields of principal cereals (wheat, barley and maize) in Rajasthan is higher than the all India average while those of secondary cereals and pulses are lower. The former are mainly grown in the wet region, and in the 'dry' region they are grown under irrigated conditions. High temperatures with very low humidity in summer, resulting in reduction of moisture supply for the crops, is a big contributory factor for low yields. The use of fertilizers per acre of cultivated land is about the lowest in Rajasthan. The cultural practices are also poor. All these factors have a depressing effect on yields.

FOREST

1.19. Forests occupy only 4.2 per cent of the geographical area of Rajasthan compared to 17.5 per cent in India as a whole. Apart from the limited forest resources of the State, their quality is also poor. Due to low productivity the importance of forests in the State economy is much less although they are most important for the soil erosion checking.

1.20. Important for their multifarious products, their role in checking erosion and in stabilizing the climate, forests were seldom looked upon as a natural resource by the rulers of the former princely States. Their interest was primarily confined to 'Shikars'. The rights and concessions enjoyed by the local people in the form of timber, fuel and grazing facilities were also the factors of indiscriminate exploitation of forests. With the establishment of the State of Rajasthan, efforts have been directed towards forest development.

Table 1.3

Showing the number of Minor Irrigation Schemes in Rajasthan State proposed in each Plan Period completed and the expenditure incurred.

Serial No.	Name of the scheme	No. of Projects		Estimated		Estimated irrigation (lakh acres)	No. of schemes completed	Expenditure on completed schemes (lakhs)	Irrigation potential created	Total expenditure on schemes completed/under construction
		Proposed	Spillover	Cost (in lakhs)	Spillover					
1	2	3	4	5	6	7	8	9	10	11
1	First Plan Schemes	244	..	193.18	..	1.750	186	53.05	0.56	108.62
2	2nd Plan Schemes—									
	(i) Spillover from 1st Plan	..	58	..	86.56	..	45	..	..	166.96*
	(ii) New Schemes	96	..	241.10	..	0.766	15	28.10	1.04	..
3	3rd Plan Schemes—									
	(i) Spillover from 1st Plan	..	13	..	8.5	..	..	..	..	187.42†
	(ii) Spillover from 2nd Plan	..	81	..	167.00	..	..	..	..	..
	(iii) New Schemes	24+33	..	{ 59.96 124.18	..	0.600	..	..	0.60	125.00‡
		364+33	..	618.42	..	3.116	246	..	2.20	586.00

*It includes 16.19 lakhs spent by Panchayat Samities on works costing less than Rs. 25,000 each.

†Expenditure incurred upto 1963-64.

‡Expenditure anticipated during 1964-65 and 1965-66.

MINOR IRRIGATION

1.21. While the problems of the State are varied and many, this study is primarily directed towards an appraisal of techno-economic aspects of minor irrigation works. Outlay on minor irrigation works and areas intended to be served in various plans are given in Table 1.3.

1.22. Dove-tailed into the scheme of larger irrigation system the minor irrigation works can result in a composite system of irrigation leading to a more whole-some utilisation of the land and water resources of the State so as to yield optimum agricultural production.



CHAPTER II

IRRIGATION TANKS AND STORAGE RESERVOIRS

2.1. In Rajasthan about 68 per cent of its irrigated acreage is dependent on small irrigation works like wells, tanks and *rapats* etc. Out of this 68 per cent about 12 per cent is irrigated from tanks and small reservoirs, the remaining from open wells and other miscellaneous sources. Also these tanks and small reservoirs are community source of minor irrigation whereas wells are mostly owned and worked by individual farmers.

2.2. As no rivers and big streams flow through Rajasthan local rain is the only source of water. It is stored in many a small reservoir or tank from times immemorial. These irrigation tanks were mostly built by the rulers and *jagirdars* of the erstwhile, princely States. At the time of the merger of the States with Indian Union some of these works were in fair condition while many lay neglected for a long time past. A large number of these have since been reconditioned and brought into working order.

2.3. These tanks and reservoirs can be classified under three categories—

- (a) Those irrigating upto 50 acres and below. They are now managed by *Panchayat Samities*. The irrigation from such tanks is recorded by the *Panchayat* staff and collection of irrigation charges realised through the Collector and credited to the accounts of the *Panchayats*.
- (b) Tanks irrigating from 51 acres to 2,500 acres are controlled by the Revenue Authorities with regard to distribution of their water supplies and assessment of water rates though maintained by Irrigation Department.
- (c) Tanks with capacity to irrigate more than 2,500 acres are under control of Irrigation Department both with regards to maintenance as well as regulation and assessment.

2.4. The Team had the occasion to visit a number of these tanks and reservoirs in different parts of the State during their field studies. Their locations are marked in the index map at Fig. 2.1. Observations of the Team are contained in following paragraphs.

Magra Tanks

2.5. There are 13 tanks located in Kolayat *Tehsil* of Bikaner district at a distance of some 30 miles west of Bikaner town. This tract is known as Magra. The tanks thus derive their name from this area. The normal annual rainfall of the tract is about 11.5 inches. The sub-soil water level is about 250 ft. below ground. Underground water is generally saline. Magra tanks were constructed by the late Maharaja Ganga Singh of Bikaner as famine relief works during thirties.

2.6. The particulars of these tanks are given in Table 2.1.

2.7. The storage capacities and the C.C.As. do not appear to be fully reliable. Except for Gangsarowar and Mudh Bund, all other *bunds* are just contour *bundies* to cause submergence of enclosed areas by rain water for bed cultivation. The actual irrigation in some years has been of the

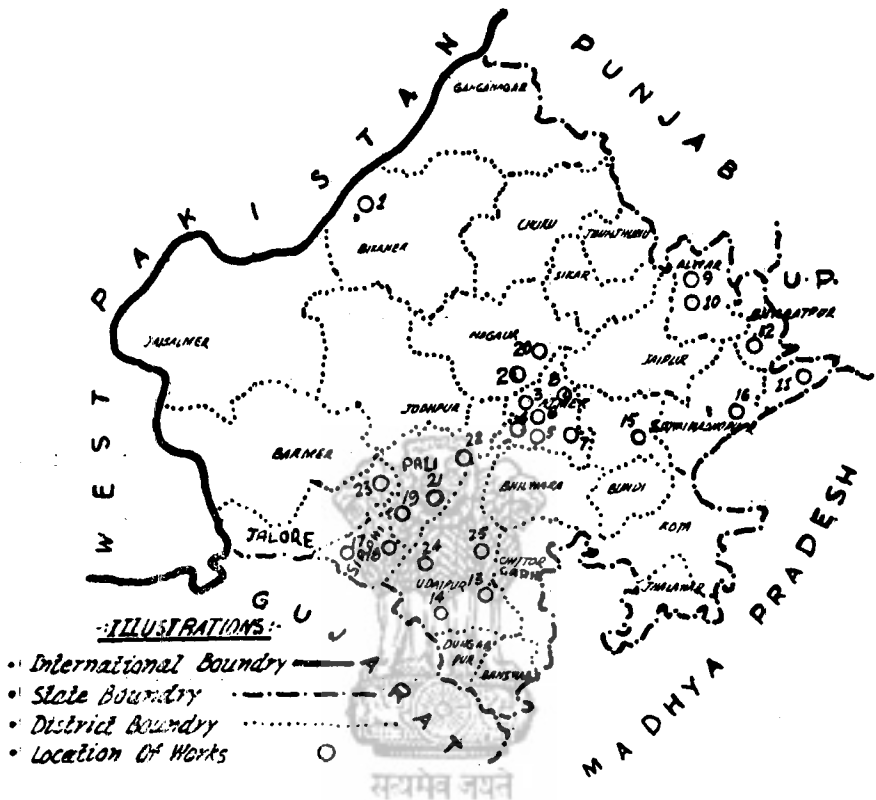


Fig. 2.1—Map showing locations of tanks and reservoirs.

List of Tanks and Storage Reservoirs

- | | |
|---------------------------------|----------------------------------|
| 1. Magra Tank. | 13. Harchand Tank. |
| 2. Piplia Tank. | 14. Jaisamand alias Dhebar Tank. |
| 3. Shakti Sagar
Tank Kharwa. | 15. Moti Sagar Tank. |
| 4. Jewaja Tank. | 16. Mui Bund Canal. |
| 5. Rejiawas Tank. | 17. Tokra Bund. |
| 6. Balai Khera. | 18. Kadambari Bund. |
| 7. Parbat Sagar. | 19. Bhula Bund. |
| 8. Jalthaman. | 20. Harsore Tank. |
| 9. Sili Serhi Tank. | 21. Dingore Tank. |
| 10. Jey Samand | 22. Saran Bund. |
| 11. Urmila Sagar Tank. | 23. Bankli Bund. |
| 12. Baretha Tank. | 24. Udai Sagar. |
| | 25. Bhopal Sagar. |

Table 2.1.

Statement showing capacities, proposed C.C.As. and actual irrigation of the Magra Tanks, Kolayat Tehsil, Bikaner District

Name of Tank	Storage capacity in M. cft.	Proposed CCA	Actual area irrigated in acres during the year															
			1954		1955		1956		1957		1958		1959		1960		1961	
			Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Gangarower	94.00	444	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	134	N.A.	N.A.	N.A.	N.A.	N.A.	34
Mudh Bund	10.20	92	Nil	Nil	459	..	450	..	1,580	..	..	580	..	N.A.	N.A.	N.A.	N.A.	98
Bund No. 1	50.56	665	133	53	103	58	57	..	58	..	..	69	..	N.A.	N.A.	N.A.	N.A.	..
Bund No. 2	6.00	134	354	Nil	21	..	256	..	244	..	..	244	..	N.A.	N.A.	N.A.	N.A.	22
Bund No. 3	7.78	114	Nil	..	..	..	21	..	24	..	..	24	..	N.A.	N.A.	N.A.	N.A.	..
Bund No. 4	38.43	345	35	..	78	..	206	..	242	..	..	243	..	N.A.	N.A.	N.A.	N.A.	..
Mandal Bund	61.23	493	545	..	557	60	517	67	510	4	..	510	..	N.A.	N.A.	N.A.	N.A.	53
Kauiya Bund	14.11	165	196	..	115	38	..	201	165	9	..	165	N.A.	N.A.	N.A.	N.A.	N.A.	49
Dadar Bund	12.30	230	175	..	36	..	285	..	281	..	..	281	N.A.	N.A.	N.A.	N.A.	N.A.	..
Saitia Tank	13.50	189	239	3	245	..	284	..	214	..	..	215	N.A.	N.A.	N.A.	N.A.	N.A.	..
Bhata Tank	6.00	115	Nil	..	..	..	..	..	..	..	..	312	N.A.	N.A.	N.A.	N.A.	N.A.	..
Khadi Tank	5.30	56	49	9	59	..	38	..	57	..	..	58	N.A.	N.A.	N.A.	N.A.	N.A.	..
Jhinjina Tank	13.80	170	62	..	104	..	137	..	123	..	..	123	N.A.	N.A.	N.A.	N.A.	N.A.	..
Total	333.21	3,212	1,788	65	1,777	156	2,191	268	3,498	13	..	2,958	N.A.	N.A.	N.A.	N.A.	N.A.	282

order of 3,000 acres to 3,500 acres. But it is reported to have gone down considerably in recent years partly because of poor maintenance and partly due to insufficient rainfall.

2.8. The present condition of maintenance of these *bunds* is generally poor. The sluice gates of Gangsarowar are reported to have been stolen. They have not been replaced leading to its inefficient operation. Mudh Bund is lying breached for the last 15 years or so. Even a public highway has been aligned through the bed of the tank in utter disregard of the fact that the alignment falls in the erstwhile submerged area of the tank.

2.9. These *bunds* were originally in charge of B&R branch of the P.W.D. But in 1952 they were transferred to the State Irrigation Department. They are now under Gang Canal Irrigation Division, Sriganganagar. The headquarters of the Executive Engineer and even Assistant Engineer are more than 200 miles away from these tanks. The department has been spending about Rs. 10,000/- annually on the maintenance of these works (mostly for watching establishment *etc.*). This amount is reported to be inadequate even for ordinary maintenance and no special repair works can be undertaken. It was stated that the area of these tanks is to be included in the eventual command of Rajasthan Canal under a lift channel scheme. In the meanwhile the irrigation department, it is understood, has recommended to the State Government to transfer all these tanks for the intervening period to the charge of Revenue authorities both for their maintenance and revenue assessment and realisation.

Piplia Bund

2.10. The *bund* is situated near village Piplia, *Tehsil* Merta, district Nagaur. It is 4 miles away from the road from Merta City to Ajmer opposite its mile No. 37. The construction of the dam was originally started in the year 1941 by the *Jagirdar* of the village but was left incomplete. It has, however, been completed by the Irrigation Department recently. Water was stored in it in 1964 for the first time.

2.11. The dam is a masonry structure 245 ft. long, 5 ft. high with its foundation on the exposed-rocky bed. Its catchment area is 3 sq. miles. Average annual rainfall is 15 inches. Revised estimated cost is Rs. 48,400/- (original estimated cost being Rs. 24,370/- only). The live capacity of the tank is kept at 11.128 m. cft. This year in spite of good rainfall the water-level was about 2.5' below the weir sill. It is doubtful if it will normally be filled upto expectations. It is anticipated to benefit 40 acres only by submergence and 90 acres by irrigation through a one mile long lined channel. The regulation is supposed to be done by the cultivators themselves. The project shows an anticipated financial return of 1.58 per cent allowing only Rs. 180/- for annual maintenance.

2.12. The team feels that the actual maintenance expenditure on the weir and on the channel and its head regulator will be considerably higher than Rs. 180/- provided, and the revenue may be less than anticipated. Workmanship of the masonry of the weir appeared poor and at the time of team's visit fair amount of leakage was noticed through the masonry. It needs attention, before any serious damage occurs.

2.13. In cases like this, it may be worthwhile to extend the command and provide only one or two waterings for pulses and oilseeds rather than 3 to 4 waterings for wheat. It will cut short the losses in the tank, bring more area under irrigation and expose more bed area for cultivation due to quicker utilisation of impounded water.

Shakti Sagar Tank Kharwa

2.14. This is an old tank said to have been constructed about 60 to 70 years ago in village Kharwa, *Tehsil* Beawar, district Ajmer where average annual rainfall is about 20 inches. The *bund* is 1800 ft. long. It is provided with 209 ft. long masonry waste weir. The catchment and storage capacity of the tank are reported to be 9.34 sq. miles and 228 m. cft. respectively. Annual irrigation is estimated to be only 140 acres, the C.C.A. being only 226 acres, commanded by direct outlets provided in the *bund*.

2.15. No recording of irrigation is done as the water rate is included in the land revenue according to the settlement records. This is another case where it is felt that optimum use of the water is not being made. A big tank like this should be able to irrigate at least 1,500 acres even in poor rainfall years. The possibility of extending its command by construction of an irrigation channel needs to be investigated.

Jewaja Tank

2.16. Another old tank near village Jewaja on the Beawar-Dewair road, constructed some 50—60 years ago and known as Jewaja tank is irrigating about 300 acres annually. Its C.C.A. served through a small channel of about 3 cusecs capacity is 450 acres. The length of the tank *bund* is 1,460 ft. (with 264 ft. masonry waste weir) and its average height is 21 ft. The storage capacity is reported to be 79.3 m.cft. The seasonal irrigation figures for the three years, 1959-60 to 1961-62 which could be collected are—

Year	Area irrigated			Amount assessed
	Kharif	Rabi	Total	
	(in acres)			(Rs.)
1959-60	2.5	294.50	297.0	2,017.75
1960-61	180.25	121.25	301.50	1,509.25
1961-62	64.50	275.00	339.50	2,972.00

2.17. In this case too it was observed that the command is not commensurate with the capacity and consequently some of the cultivators had taken to rice cultivation even though the annual rainfall was only 20 inches. The water for *rabi* irrigation was also being wastefully utilised. It may be possible to extend its command in the interest of optimum utilisation of the water and getting better agricultural production from the existing land and water resources. A revised crop pattern could be worked out with advantage.

Rejiawas Tank

2.18. This tank constructed about 70 years ago is situated in village Rejiawas east of Beawar-Dewair road opposite its mile 70. Its capacity is reported to be 104.47 m.cft. It is meant for an annual irrigation of 518 acres

out of a C.C.A. of 630 acres, served through two canals of 5 and 10 cusecs capacity each. The actual irrigation for 1959-60 to 1961-62 are—

Year	Area irrigated (acres)			Amount Assessed (Rs.)
	Kharif	Rabi	Total	
1959-60	..	1.25	520.5	3,035
1960-61	..	50.25	49.50	315
1961-62	..	116.50	572.50	705

2.19. The water from this tank appeared to be comparatively better utilised through a satisfactory layout of water-courses. There is, however, room for improvement in utilisation by improved regulation of the supplies. This needs to be attended to.

Balai Khera Tank

2.20. It is a small tank of 5.3 m.cft. live capacity under the charge of Block committee in Balai Khera village, district Ajmer. The work comprised repairing of an old 700 ft. long earthen *bund*, providing a masonry escape weir and the construction of a watercourse direct from the *bund* to command about 60 acres culturable area. The work estimated to cost only Rs. 14,369 was taken up by the Block *Samiti* in 1961. The waste weir construction and the *bund* repairs were completed in 1961, but the watercourse had not even been started, when the team visited the site in October, 1964. The tank was full. But for want of watercourse (about $\frac{3}{4}$ mile long), the storage water could not be utilised. The B.D.O. informed that he was trying to get the watercourse construction expedited to use the water for *rabi* irrigation of 1964-65.

Parbatsagar Tank

2.21. This is an old tank constructed about 60—70 years ago. Its re-conditioning was carried out in 1953 at a cost of only Rs. 7,515. It commands a C.C. area of 125 acres only and the submerged area is about 15 acres. The live capacity of the tank is reported as 12.34 m.cft. Average irrigation for the last 11 years (1953-54 to 1963-64) is reported only 33 acres with a maximum of 105 acres in 1956-57 and a minimum of 2 acres in 1960-61 and 1963-64 as detailed below—

Year	Area Irrigated (acres)			Amount Assessed (Rs.)
	Kharif	Rabi	Total	
1953-54	..	6	6	28.59
1954-55	17	..	17	83.91
1955-56	..	31	31	435.08
1956-57	22	83	105	252.77
1957-58	..	35	35	175.80
1958-59	..	49	49	196.00
1959-60	..	96	96	548.22
1960-61	2	..	2	8.40
1961-62	..	7	7	30.40
1962-63	..	13	13	70.62
1963-64	2	..	2	27.52

2.22. The tank is one of those which are under dual control *viz.* under Irrigation Department for maintenance and under Revenue Authorities for distribution of water and assessment of revenue. During rainy season the irrigation department keeps a *beldar* for its watching. The team feels that one of the reasons for poor performance of the tank is the dual control system and the non-technical control on the distribution of supplies. It is doubtful if such dual control would ever generate sufficient interest in the staff for optimum utilisation of the supplies available.

Jalthaman Tank

2.23. This tank is 70 years old. It is situated just outside Kishangarh town. It is reported to have been reconditioned during the second Plan period. Its capacity is reported to be 5.7 m.cft. and commands an area of 160 acres. It is supposed to provide only one irrigation to about 125 acres and a bed submergence of about 25 acres. Pipe outlets fitted with wooden-plugs are provided in the *bund* for irrigation. In this case no irrigation rate is charged. It is reported to be included in the land revenue rate according to the settlement. The general condition of the *bund* was poor. Its outerslopes were cut at places by cultivators. The irrigation from the tank in 1960-61 and 1961-62 is reported to be nil while in years 1959-60 and 1962-63 it is reported as 101 and 95 acres respectively. Here again it was felt that the performance could be improved if the maintenance, regulation and the assessment were rid of dual control.

Siliserh Tank

2.24. This tank was built in 1845. It is about 10 miles south-west of Alwar town. It is surrounded by hills on three sides and the dam *bund* and the sluice gates on the fourth side. Its independent catchment is reported to be 52.8 sq. miles of hilly tract. Its storage capacity is reported to be 492.03 m. c.ft. and the water spread only 492 acres. The maximum designed depth of water is 28 ft. The tank provides irrigation to the orchards and other valuable agricultural land in and around Alwar town. It is also a tourist attraction because of picturesque surrounding and provision of a comfortable rest-house over looking the lake.

2.25. Two *pucca* masonry channels of 12 cusecs and 20 cusecs capacity, one high level and the other low level 8.7 and 7.8 miles long respectively, take off from the tank and run along the toe of a hill at different levels, parallel to the road to Alwar. The channels are rectangular in section and are fairly well built. But being very old, the mortar at places is disintegrating causing small leakages. Expeditionary special repairs of the channels are called for.

2.26. The channels are provided with pipe outlets of 6", 9" and 12 inches diameters mostly freefall apparently on an *ad hoc* basis without consideration of the area commanded by each. The irrigation is charged per acre per watering as given below:—

Rs. 6/8 per watering per acre within municipal limits.

Rs. 5/- per watering per acre upto 8 miles of the *bund*.

Rs. 4/- per watering per acre for the rest.

2.27. The natural tendency of the cultivators appears to be to over irrigate their fields. There were indications of wastage of water. It was also stated that cultivators do not take water at night. The outlet sizes

need to be rationalised considering the commanded areas and the working head of each outlet. The channels should run continuously day and night for a certain number of days to provide one watering and then kept closed completely for some time till the next watering is required. This will lead to economical use of water and also help in exercising efficient control on the assessment of irrigation. At present there is the possibility of concealment due to mixing up of waterings.

2.28. At present the tank irrigates about 2,000 acres of *kharif* and *rabi* combined. Figures for the past five years are given below—

(in acres)

Year			Kharif	Rabi	Bed	Total
1959-60	..	..	303	1,124	..	1,427
1960-61	..	..	176	1,647	..	1,823
1961-62	..	..	200	1,862	..	2,062
1962-63	..	..	243	1,367	..	1,610
1963-64	..	..	234	1,762	..	1,996

2.29. Generally 2 waterings of about $3\frac{1}{2}$ " depth each are taken to mature the crops. But even if 4 waterings of $4\frac{1}{2}$ " each including losses in watercourses and the *pucca* channels were taken by the entire area irrigated, it will account for only 3,000 acre ft. or about 130 m. cft. out of the maximum tank capacity of 493 m. cft. It will be desirable to draw up a regular water budget for utilisation of its supplies every year and make use of the surplus water appropriately.

2.30. The soil of the commanded area appeared to be quite suitable and under proper guidance by the agriculture officers and judicious regulation of supplies by the Irrigation Department, the team feels that the tank command could be converted into an excellent vegetable and sugarcane producing area instead of the comparatively poorer variety of crops grown there at present.

2.31. Incidentally this is an ideal tank where a detailed water account to compute losses in the tank and in the channels and watercourses and the actual water depth and the number of waterings utilised for different crops could easily be maintained without much extra expense. As such it could serve as an experimental area from which results could be utilised for guidance elsewhere in the region.

Jai Samand Tank

2.32. This storage tank is situated between villages Dilwari and Belana in a gap between two hills at about 4 miles to the South west of Alwar Town. There is a metalled road leading to the tank branching off from the Alwar Siliserh Road. The *bund* was originally constructed in the year 1910. But it breached in 1917 and was reconstructed in 1918-19 at a cost of Rs. 18 lakhs. The *bund* is 4,581 ft. long and has a masonry core wall, except in the breached portion repaired in 1917. The height of the embankment at the deepest point is 33 ft. The full supply depth is 25

ft. Its independent catchment is 69.4 sq. miles of hilly area (considering 20 sq. miles of plain area equivalent to one sq. mile of hilly area). The tank is fed from the Ruparel catchment from Bara weir through a feeding channel. Its live capacity is reported to be 830 m. cft. but in years of normal rainfall the yield is reported to be only about 250 m. cft.

2.33. The tank has two earthen canals and 5 small minors. Capacity of the canals is reported as 36 cusecs & 20 cusecs respectively and total length is 14 miles. The G.C.A. is reported to be 26,680 acres, CCA 26,680 acres and the annual irrigation anticipated is 13,846 acres. The actual irrigation figures for the last four years are—

(in acres)

Year			Kharif	Rabi	Bed	Total
1960-61	..	..	..	6,534	..	6,534
1961-62	..	..	9	6,580	..	6,589
1962-63	..	..	10	3,480	..	3,490
1963-64	..	..	5	5,640	..	5,645

2.34. On this canal system also the outlets need rationalisation and its regulation can be improved to achieve better utilisation of supplies. The possibility of supplementing the storage of this tank from the surplus waters of Siliserh tank as indicated in para 2.29 could be investigated. There is *rabi* cultivation of submerged area and therefore the inside cultivators are usually keen on early emptying of the tank. The authorities concerned should be able to fix some such procedure, which without causing any undue hardship to the inside cultivators allows optimum utilisation of the storage without causing water to go to waste.

2.35. One way to do it could be to encourage large scale cultivation of oilseeds and pulses in the irrigation command of the canals so that in the lesser number of waterings and in shorter period a larger area receives irrigation benefit. This may work out to be more paying to the cultivators comparing financial returns per acre inch of irrigation.

Urmila Sagar Tank

2.36. Urmila Sagar is one of the big tanks in Dholpur area. It is capable of irrigating more than 2,500 acres, through the canals, besides bed cultivation. The assessment of the irrigation from this tank vests with the Irrigation Department. The tank is situated on Dholpur-Bari Road near village Nibri about 11 miles from Dholpur. The road passes over the embankment of the tank which is 2 miles long.

2.37. This tank was built by the late ruler of the princely State Dholpur in 1922. Its catchment area is reported to be 20.12 sq. miles and the live storage capacity 535 m. cft. The submerged area is reported to be 1,841 acres. The reservoir is provided with a masonry sluice for the head works of a canal called the Urmila Sagar Canal. The G.C.A. of the canal is 6,521 acres with a culturable commanded area of 5,950 acres. The bed of the tank dries up in course of time and it is leased out from year to year for cultivation on *patta* system.

2.38. The canal is 8 ft. wide with F.S. depth of 2.6 ft. and is 10 miles long. The outlets are mostly R. C. hume pipes of 6 inches, 9 inches and one foot diameter and do not appear to be based on area statistics or the working heads but seem to be fixed on an *ad hoc* basis. They are usually oversized. The irrigation from the Urmila Sagar tank for the last seven years is—

				(in acres)	
Year		Kharif	Rabi	Total	Bed Irrigation
1957-58	..	452	2,951	3,403	..
1958-59	..	523	2,742	3,265	..
1959-60	..	762	2,602	3,364	..
1960-61	..	107	1,688	1,795	..
1961-62	..	308	2,730	3,038	342
1962-63	..	285	2,431	2,716	792
1963-64	..	20	2,746	2,766	711

Considering the capacity of the reservoir the irrigation from the canal could have been more than 5,000 acres had the supplies been used economically and scientifically.

2.39. The officers incharge could not supply the water account of the tank for the past years. No detailed scrutiny could thus be made. But from the site inspection and the discussions with the State Officers it appears that there is room for improving the utilisation of supplies of this tank by rationalisation of outlets and improvement of the regulation of the canal. At present the cultivators on the canal, particularly those of the head reach do not irrigate their fields at night. They close their outlets at sunset or waste the water into adjoining waste-lands. During day time they take the entire water of the canal even by making cuts and putting *bunds* if necessary and do not let it pass down to the lower villages untill after their own demand is fully met. This is the position even after the canal has been in existence for over 40 years. The canal is kept running continuously in *rabi*.

2.40. If the outlet sizes are fixed on scientific basis and the channel is run rotationally to allow about one watering per month or 3 weeks (which should be the normal requirement in *rabi*) it may be possible to increase the area under irrigation. The canal laws need to be enforced in the interest of equitable distribution and economical use of supplies. *Warabandies* on outlets need to be encouraged to make people take to night irrigation as well.

2.41. Because of the assured water supply on this canal people have taken to sugarcane cultivation and about 300 acres of sugarcane is irrigated during *kharif* while in *rabi*, the irrigated crops are mostly wheat and *gochani* (wheat mixed with gram). The crop pattern needs to be studied from the point of view of optimum utilisation of both land and water resources available.

Baretha Tank

2.42. This is another very old tank in Bharatpur district, Biyana *Tehsil* (constructed in 1897). The tank has a catchment of 70 sq. miles and its live capacity is reported to be 1,190 m. cft. The *bund* is 3,800 ft.

long with a maximum height of 40 ft. Three canals known as canals No. 1, 2 & 3 take off from it. The particulars of the canals are—

Canals	No. 1	No. 2	No. 3
Bed width	12'	8'	11'
F.S. depth	2·9'	2·8'	2·8'
Discharge at head (designed) ..	60·9 cs.	40 cs.	69·3 cs.
Bed slope	1 in 5,000	1 in 4,000	1 in 3,300
Total length in miles	4·3	5·2	6·3
C.C.A.	10,000 acres		
Annual proposed irrigation ..	7,000 acres		

2.43. The actual irrigation figures on the system for the seven years 1956-57 to 1962-63 are given below—

Year	Kharif	Rabi	Zaid Rabi	Total
1956-57	1,068	3,579	43	4,690
1957-58	1,368	3,528	..	4,896
1958-59	1,519	4,259	..	5,778
1959-60	1,332	4,482	..	5,814
1960-61	1,259	5,522	42	6,823
1961-62	1,368	5,247	388	7,003
1962-63	1,037	4,991	523	6,551

2.44. The water account of the reservoir is not available but it is evident that the water is not being put to optimum use. The capacities of the channels and their outlets are too big for the areas served and this leads to wastage of water. Rationalisation of channels capacities and outlet sizes, introduction of rotational running of supplies and their equitable distribution appears to be called for. That is bound to increase the efficiency of water-use of all such schemes.

Harchand Tank

2.45. This tank in Sarda *Tehsil* of Udaipur district is reported to have been completed in 1954, under First Five Year Plan, at a cost of Rs. 3.29 lakhs. The live capacity of the tank is reported to be about 222 m. cft. The project also included construction of two canals from the tank, the Left Bank Canal of 9 cs. capacity and the Right Bank Canal of 18.8 cs. to command C.C.A.s of 520 acres and 780 acres respectively. The Left Bank Canal was completed in 1956 while the construction of the Right Bank Canal was still in progress in October 1963. The delays are stated to be due to delay in financial sanctions and allotment of funds. Such delays in completion of projects cause unnecessary locking up of capital as also a sense of frustration in the mind of beneficiaries.

2.46. The Left Bank Canal started functioning from *rabi* 1956-57 and is reported to have done a maximum irrigation of 677 acres against its C.C.A. of 520 acres. It appears the area statistics of the canal are not quite correct. They may be checked up and corrected if necessary.

Jaisamand alias Dhebar Lake

2.47. There is a very big lake known as Jaisamand lake also known as Dhebar lake about 32 miles South-East of Udaipur. It is reported to have been created more than 250 years back on the catchment of Gomti *nadi*. This lake though initially constructed for *Shikar* and pleasure is since being used for irrigation purposes also, as major project to command C.C.A. of 68,104 acres in scattered patches and to irrigate 40,862 acres (60 per cent of C.C.A.) annually. This project was also visited by the Team. The project is at present irrigating only about 15,000 acres. It is felt that performance of the project could be considerably improved by improving the distribution system (both the canals and the outlets) and the regulation of supplies on them.

Moti-Sagar Tank

2.48. The tank is located in village Dhurwa, district Tonk. Its capacity is reported to be 440 m. cft. and catchment 42. sq. miles. A canal known as Motisagar Canal with a capacity of 57 cs. takes off from the tank. The C.C.A. on the canal is reported as 5,354 acres and the proposed annual irrigation is 3,000 acres. The project was completed under Second Five Year Plan at a cost of Rs. 4.14 *lakhs*. The development of irrigation on the canal is slow. The maximum irrigation attained in 1963-64 (9 years after the commissioning of the project) was 1,543 acres only.

2.49. The main reasons stated for slow development and poor utilisation of the potential were that the cultivators had not taken to night irrigation and were also slow in taking to improved varieties of crops needing irrigation. Many of them still preferred to grow *katha* variety of wheat which normally grows without any irrigation in the area. Its grain yield is low (3 to 5 mds. per acre) although its straw yield is said to be good. Mostly the fields were not prepared for canal irrigation and were big, uneven and irregular. The outlets were over-sized. Unauthorised acts of putting in temporary daffs in the canal were common and no punitive rate was being levied for such unauthorised acts.

2.50. The rate of development could be improved if outlets were rationalised, regulation of the channel improved to run it continuously for a week or so and then to keep it closed till the next watering is needed for the crops and introduction of *warabandi* on the outlets so that people take to use of irrigation water at night. Establishment of a State-owned demonstration farm in the area and the laying out of the cultivators' demonstration-plots in the command to encourage introduction of improved varieties of crops requiring irrigation may help in early achievement of the targeted irrigation. It is felt that cotton could also be introduced in the area with advantage. The soil and the climate appear suitable for it. Stricter enforcement of the Canal Act provisions to check the unauthorised acts of selfish cultivators appears necessary. Persuasion may help in the speedy construction of watercourses as the pressure on land in the area is comparatively less, and the land is not as costly as elsewhere.

2.51. It appeared rules for the checking of irrigation in the field by officers were not being strictly enforced and there was the possibility of concealment of irrigation. The checking of irrigation particularly on all new projects needs to be intensified.

Mui Bund Canal

2.52. This is a project of the First Five Year Plan consisting of a *bund* and a canal. It is situated about 3 miles west of Sawai Madhopur. The *bund* is about 3,000 ft. long and the canal 6.3 miles in length. The project was completed in 1954 at a cost of Rs. 2.57 *lakhs*. The live capacity of the tank is 93.6 m. cft. and the capacity of the canal is 16 cusecs to command a C.C.A. of 1,788 acres. Annual irrigation projected is 1,105 acres. The maximum irrigation achieved so far is only 397 acres in 1961-62. No water account of the tank could be had but it appears the reasons for the very slow development of irrigation were in general the same as mentioned above in para 2.49 for the Moti Sagar Project.

Tokra Bund and Canal

2.53. This project was constructed in First Five Year Plan at a cost of Rs. 4.30 *lakhs*. It consisted of an earthen *bund* 3,360 ft. long about 8 ft. high, provided with waste-weir and an irrigation canal, 5.2 miles long, of 19 cusecs capacity, taking off from the *bund*. The catchment of the *bund* is 14 sq. miles. The *bund* is located in village Tokra at the toe of Mount Abu Hill in Reodat Taluka of Sirohi district. The live capacity of the tank is 183.5 m. cft.

2.54. The C.C.A. of the canal is 2,649 acres and the proposed annual irrigation is 1,840 acres. Table 2.2 gives the performance of the scheme for the last 5 years—

Table 2.2

	1959-60	1960-61	1961-62	1962-63	1963-64
Rainfall	N.A.	N.A.	45.45"	18.67"	19.03"
Live water stored (M.cft)	110	151	183.60	183.60	149
Water utilised (M.cft)	110	130	155	163	110
Area irrigated (acres)	339	930	1,084	1,110	N.A.
Revenue realised	3,053.52	8,967.40	9,481.79	10,550.85	N.A.

2.55. It is reported that on an average the area receives six waterings. The area irrigated is hardly about 6 acres per m. cft. This shows that excessive waterings are being applied and the water is not being put to its optimum use. The regulation and distribution of supplies can be improved by rotational running of the canal and rationalisation of outlets. This will improve the utilisation.

2.56. The area irrigated is almost entirely wheat. The utilisation could be improved if the storage is used up quickly by taking to oilseeds and pulses rather than concentrating only on wheat. The return to the cultivator per acre inch of water used may also increase.

Kadambari Bund and Canal

2.57. This scheme was constructed under Second Five Year Plan at a cost of Rs. 4.75 lakhs. It is situated in village Kadambari, Pindwara Taluka, district Sirohi. The *bund* is only 900 ft. long with its maximum height being 40 ft. The live capacity of the tank is 134.3 m. cft. The *bund* is provided with a waste weir. A seven mile long earthen canal of 13.5 cs. capacity takes off from the tank.

2.58. The C.C.A. on the canal is 2,611 acres and the annual anticipated irrigation is 1,340 acres. The scheme came into operation in 1962-63. During the two years 1962-63 and 1963-64 the actual storage was 120.0 and 128.4 m. cft. respectively. But the areas irrigated in the two years are reported to be 276 acres and nil respectively. The reason for the extremely poor utilisation is reported to be lack of demand on the part of the cultivators because most of the land is reported to be *chahi* area. This needs looking into.

Bhula Bund

2.59. This is an earthen *bund* 800 ft. long in village Bhula, Pindwara, Taluka, district Sirohi, built under First Five Year Plan at a cost of Rs. 4.43 lakhs. It is provided with a waste weir and bye-wash. The live capacity of the reservoir is reported to be 158 m. cft. A 4 miles long canal takes off from the *bund* to command an area of 1,832 acres. It provides an annual irrigation of 1,725 acres.

The performance of the scheme since 1954 is:—

Year		Water-stored above sluice level (m.cft.)	Water utilised (m.cft.)	Area irrigated (acres)	No. of waterings	Revenue realised (Rs.)
1954-55	..	N.A.	N.A.	6	..	30.62
1955-56	..	N.A.	N.A.	356	..	3,102.24
1956-57	..	N.A.	N.A.	630	..	4,770.81
1957-58	..	N.A.	N.A.	854	..	8,039.84
1958-59	..	N.A.	N.A.	906	..	8,163.45
1959-60	..	157.63	122.00	847	5	8,075.14
1960-61	..	157.63	98.00	969	4	7,998.64
1961-62	..	157.63	127.35	778	4	6,997.21
1962-63	..	100.78	71.75	474	4	3,898.28
1963-64	..	71.55	46.00	..	..	..

2.60. In the case of this scheme also, the poor performance is attributed to considerable *Chahi* area included in the command. It needs looking into. If necessary and feasible the canal and its command may be extended so that supplies impounded in the reservoir are put to their optimum use.

Harsore Tank

2.61. Harsore tank in district Nagpur, taluka Degana, village Harsore is an old tank which had gone in to disuse. It was restored under First Five Year Plan at a cost of Rs. 10 lakh. The restoration work started in 1953 was completed in 1955.

2.62. The earthen *bund* 1,839 ft. long is provided with waste-weir (361 ft. overflow, 300 ft. byewash). Its main canal is 3.2 miles long, with its designed discharge of 10.13 cusecs. A minor, 1.2 miles long takes off from the main canal.

2.63. The tank is situated in an annual normal rainfall zone of 16". Its catchment area is 30 sq. miles. The storage capacity of the tank is 88.77 m. cft. The C.C.A. of the project is 1,431 acres and maximum annual irrigation anticipated is 1,050 acres including about 100 acres bed irrigation.

2.64. The following table shows the particulars of storage received and utilised along with area irrigated and revenue realised during the last 5 years—

	1959-60	1960-61	1961-62	1962-63	1963-64
(i) Rainfall (inches)	13.78"	6.61"	17.28"	15.87"	12.56"
(ii) Water stored (m.cft.)	19.27	14.85	26.07	88.77	75.22
(iii) Storage available on the day the canal was opened (m.cft.)	19.27	6.43	14.85	40.24	48.83
(iv) Water utilised (m.cft.)	17.85	6.43	14.29	47.38	48.83
(v) Area irrigated (acres)	108	117	154	574	441
(vi) Area irrigated per m. cft. of water utilised (acres)	5.94	18.2	10.77	12.12	9.03
(vii) Waterings	4	4	4	4	4
(viii) Revenue realised in (Rs.)	893	383	944	3,701	2,476

2.65. These figures show that the area irrigated per million cft. varied between 5.94 acres and 18.2 acres. 1960-61, when water was utilised most economically, was the driest year. Evidently people could not afford to waste any water in that year and tried to use available water to its maximum advantage. If similar use could be made of stored supplies in other years too, the ultimate economic gain from irrigation supplies available could be great. It is, therefore, felt that if the regulation and distribution of supplies is improved by rotational running of the channel and rationalisation of outlets, the irrigation on the scheme could be increased considerably, especially if more areas are sown with pulses and oil-seeds rather than with wheat.

Dingore Project

2.66. Dingore Project is situated in district Pali, *Taluka* Kharchi, village Dingore. It is about 2 miles from Phulad Railway Station on Marwar-Junction-Udaipur Section of Western Railway.

2.67. The project is new. It was started in 1960 and completed in 1962. The cost of the Project is Rs. 1,86,380. Its catchment area is 4 sq. miles only. It lies in an annual rainfall zone of 19". The storage capacity of the project is 28.00 m. cft.

2.68. The *bund* is 205 ft. long and is provided with a waste weir (masonry overflow 70 ft. and byewash 32 ft.). A small lined canal of 2.8 cs. capacity (1.1 mile long) is proposed for a C.C.A. of 610 acres with proposed irrigation of 244 acres annually.

2.69. Although the project was completed in 1962, yet the lining of the canal was in progress in 1963-64 at the time of the Team's visit. The water of the tank was being utilised only for the lining work. No irrigation was done in the year 1962-63 and 1963-64.

2.70. It should be the endeavour of the Irrigation Department to commence irrigation, as soon as a project is completed. It took two years to complete this small work and further 2 years have been spent in putting the canal in shape. This lining work could have been done simultaneously with the other construction. The Project appears rather expensive (Rs. 764 per acre of proposed irrigation). It should be possible to extend the command and increase proposed irrigation, especially when the channel has been lined so that the water available is put to its optimum use and the cost per acre of proposed irrigation is also brought down.

Saran Bundh

2.71. Saran Project is situated in Pali district, *taluka* Sojat, village Saran. The catchment area of the tank is 6.8 sq. miles. Normal annual rainfall in the catchment is 23 inches. The storage capacity of the reservoir is 66 m. cft. of which 60 m. cft. is live storage.

2.72. The *bund* is 1.2 miles long. It is provided with a waste weir and a byewash. A canal 2.2 miles long, with a discharge of 7.58 cusecs at head takes off from the *bund*. It commands a G.C.A. of 1,299 acres, C.C.A. of 858 acres. The proposed annual irrigation is 712 acres, 600 acres by the canal and 112 acres in the bed of the tank.

2.73. The project was completed in 1962-63 at a cost of Rs. 3.39 lakhs. The cost per acre of C.C.A. works out to Rs. 395 and that of annual irrigable target to Rs. 476. The project came into operation in 1962-63 and irrigated only 61 acres in 1962-63 and 46 acres in 1963-64. The rainfall in the catchment during the two years was 14.32" and 9.91 inches respectively and the storage received was only 16.23 and 4.55 m. cft. respectively. It looks that only in very few years the project may attain the target storage and irrigation, which appear rather over estimated.

Bankli Bundh

2.74. Bankli *bund* is situated 30 miles from Pali in village Bankli, district Jalore. It is an old tank which had fallen into disuse, and was restored at a cost of Rs. 13.30 lakhs in the First Five Year Plan period.

2.75. The project is situated in an annual rainfall zone of 19 inches. It has a catchment area of 662 sq. miles. Its live storage capacity is 906.30 m. cft. and dead storage is 0.67 m. cft. The *bund* is 15,400 ft. long and is provided with a 1,800 ft. long waste weir. Two canals with capacities of 76.5 cusecs and 14.25 cs. respectively take-off from the reservoir. Total length of the system including distributaries and minors is 23.2 miles. The G.C.A. on the system is 14,221 acres. Its C.C.A. is 13,297 acres of which annual irrigation proposed is 12,830 acres. The cost per acre of the C.C.A. works out to Rs. 100.02 and that per acre of annual irrigable area to Rs. 104.

2.76. The performance of the project for the last 5 years is given below:—

	1959-60	1960-61	1961-62	1962-63	1963-64
Rainfall	6.65"	7.48"	13.06"	10.83"	6.95"
Water stored (m.cft.) ..	906.30	34.93	906.30	223.62	..
Water utilised (m.cft.) ..	828.46	..	811.65	..	..
Area irrigated (acres) ..	8,306	658	8,449	1,901	17
Revenue realised (Rs.) ..	67,104	2,630	66,551	7,277	69
No. of waterings ..	4	..	4	2	..

2.77. The maximum area irrigated was 8,449 acres in 1961-62. During this year the rainfall was 13.06" and the tank was filled to full capacity. The minimum area irrigated was in 1963-64 when it irrigated only 17 acres, while in 1959-60, with a rainfall of 6.65 inches area irrigated was 8,306 acres.

2.78. The absorption losses in the reservoir and in the canal system are stated to be exceptionally high and consequently the performance of the scheme, even in years when the tank gets full, is not up to the target. Proposals to line 3.6 miles of the main canal No. I (76.5 cs. capacity) and 2.5 miles of one of its distributaries are reported to be under consideration. It is suggested that the outlets on the system may be rationalised and intermittent running of channels resorted to, in order to avoid wastage of water which takes place with continuous running of the canals. Cropping pattern could also be so modified that most of the stored water is used up by the middle of February and the losses in the tank are cut down. This can be done by encouraging pulses and oilseeds.

2.79. It is reported that due to silting the storage capacity of the reservoir at R.L. 574.00 has gone down from 888.9 m. cft. to 746.5 m. cft. in the course of 5 years from 1956 to 1961. The drop is 142.4 m. cft. which is rather high. The matter needs serious attention so that measures to check up rapid silting of the tank, are adopted at an early date.

Udai Sagar

2.80. Udai Sagar is situated about 11 miles to the South East of Udaipur town. It is an old tank and was constructed long back in 1500 A.D. for scenic beauty as a picnic spot. The tank has a catchment area of 185 sq. miles (with an average rainfall of 25 inches) out of which 109 sq. miles is intercepted and remaining 76 sq. miles is free.

2.81. Originally the lake was not allowed to be depleted and was maintained mainly as a place of scenic beauty. Irrigation from the lake was provided only for about 1,200 acres through two canals, $5\frac{1}{2}$ miles and 2 miles in length respectively. The sill of the canals was only 6.0 ft. below the full tank level.

2.82. Under First Five Year Plan the sill of the canals was lowered by 14 ft. i.e. 20 ft. below F.T.L. and the main canal widened and extended to 19 miles length from the $5\frac{1}{2}$ original mileage. Out of the 19 miles 5.36 miles are lined and the remaining 13.64 miles are unlined. Its revised capacity was kept at 62.84 cusecs. The project cost Rs. 5.8 lakhs. The present live capacity of the sagar is 711 m. cft.

2.83. Gross commanded area of the system is 12,321 acres. The C.C.A. is 11,246 acres. The annual targeted irrigation is 60 per cent of the C.C.A.

i.e. 6,748 acres against which the actual irrigation achieved during last 6 years was—

Year	Actual Irrigation (in acres)		
	Kharif	Rabi	Total
1957-58	535	2,272	2,807
1958-59	81	2,745	2,826
1959-60	151	3,665	3,816
1960-61	810	3,945	4,755
1961-62	200	1,576	1,776
1962-63	363	646	1,009

2.84. The water account of the Udaisagar could not be had and has not therefore been scrutinised. But from the available data it appears that the water, in spite of being scarce in the locality, is not being put to its optimum use. The maximum irrigation achieved (1960-61) was only about 70 per cent of the target. In 1962-63 it was extremely poor evidently due to adverse weather conditions and failure of rainfall.

2.85. In spite of almost constant water scarcity in the area, sufficient control to ensure equitable distribution and optimum use of the available supplies is not being exercised. The outlets are fixed on *ad hoc* basis. Their ventages should be rationalised. The watercourses are very poorly maintained and lot of wastage takes place from them. The channels were found silted up badly at places and there were outcrop of rocks in their bed in some reaches where the channel does not appear to have been excavated to full designed section. These defects need to be removed. In order to avoid wastage of water the canals may be run intermittently according to demand and not continuously as appears to be the present practice.

2.86. The following table gives the cropwise break-up of irrigation for the last 6 years—

Name of crop	Years					
	1957-58	1958-59	1959-60	1960-61	1961-62	1962-63
Wheat and its mixtures	1,131	1,361	2,315	2,714	805	308
Barley	762	859	661	815	348	239
Bejar	130	149	178	238	78	41
Gram	68	122	122	91	96	22
Shakar Khand	..	..	..	..	0.41	..
Maize	122	..	11	272	4.59	103
Matar (pea)	..	..	..	..	0.51	..
Pulses	8	13	13	8	13.49	..
Rice	5	..	..	9	4	..
Methi	102	107	104	96	147	15
Sugarcane	338	60	217	268	146	185
Garden and vegetables	10	22	23	45	6	13
Cotton	8	..	17	25	28	12
Sarson	5	..	6	4	6	..
Lucern	111	133	145	170	73	64
Kangni	..	..	..	..	0.003	..
Fodder	..	..	1	..	..	5
Tobacco	7	..	12	..	..	..
Parliat Palewa	..	..	..	..	..	2
Total	2,807	2,826	3,816	4,755	1,776	1,009

2.87. The above details show that the cultivators after the introduction of the canal system have generally taken to wheat and barley in *rabi* and sugarcane in *kharif*. This is also borne out by the sample study of cropping in one of the villages *viz.* "Gudali" in the command of the project. The following table gives the cropwise breakup of irrigated and unirrigated areas both for *kharif* and *rabi* in the village for 1951-52 (a pre-project year) and 1960-61. The team feels that in a water scarce area like this, for optimum utilisation, pulses and oilseeds may be encouraged.

Irrigation in village Gudali, Tehsil Mavali, Distt. Udaipur.

Name of crop	Pre-project year 1951-52 Acreage			Project year 1960-61 Acreage		
	Irrigated	Rainfed (Barani)	Total	Irrigated	Rainfed (Barani)	Total
<i>Kharif</i>						
Maize	101.36	107.00	208.36	189.62	167.25	356.87
Jowar	..	3.90	3.90	..	1.68	1.68
Coarse grain	..	..	..	0.20	2.53	2.73
Urad	..	0.91	0.91	0.75	15.20	15.95
Sugarcane	12.48	..	12.48	46.08	..	46.08
Chillies	2.05	..	2.05	11.33	3.73	15.06
Cotton	8.16	..	8.16	2.37	0.55	2.92
Lucern	6.69	..	6.69	12.42	..	12.42
Vegetables	0.02	..	0.02	10.34	1.13	11.47
Other kharif	Nil	17.47	17.47	0.61	54.70	55.31
Total	130.76	144.67	275.43	275.46	323.22	598.68
<i>Rabi</i>						
Wheat	39.86	..	39.86	291.70	0.21	291.91
Barley	137.95	..	137.95	105.17	8.80	113.97
Gram	..	9.0	9.00	10.45	..	10.45
Goji	18.55	..	18.55	33.86	3.63	37.49
Methi	27.73	..	27.73	46.96	0.35	47.31
Onions	0.16	..	0.16	16.40	..	16.40
Goohani	..	..	..	1.23	..	1.23
Bejar	..	..	..	9.15	..	9.15
Lucern	..	..	..	13.65	..	13.65
Other rabi	..	..	..	..	..	..
Vegetables etc.	4.31	..	4.31	2.53	..	2.53
Total	228.56	9.0	237.56	531.10	12.99	544.09

Bhopal Sagar

2.88. Bhopal Sagar is situated one mile north west of Bhopal Sagar Railway Station on Udaipur-Chittorgarh section of the Western Railway. It is an old tank and was constructed more than 40 years ago during the regime of the erstwhile Mewar State. Originally the tank was mainly constructed as a place of scenic beauty for *shikar etc.* and then gradually it was converted into an irrigation tank. At present five small canals take off from the tank as shown in the Figure 2.2. The system was extended and reconditioned under the First Five Year Plan at an estimated cost of Rs. 1.79 lakhs to provide irrigation facilities to an additional area of 750 acres annually. The tank has a catchment area of 83 sq. miles and is located in the annual rainfall zone of 26 inches. Out of the total catchment area 7.5 sq. miles is intercepted and the rest 75.5 sq. miles is free. The annual normal yield expected is 755.8 m. cft. The live capacity of the tank is 635 m. cft.

2.89. It is an earthen *bund* 7,940 ft. long provided with a face wall. Its maximum height is 25 ft. It has a 941 ft. long waste weir and five scouring vents, with their sills at different levels.

2.90. The five canals taking off from the tank are 19.75 miles in length and are designed to carry 53.07 cusecs (cumulative) discharge. Total G.C.A. on the system is 12,534 acres, the C.C.A. is 10,160 and the anticipated annual irrigation is 4,245 acres area. The canal-wise particulars are—

Sl. No.	Particulars	Canal No. 1	Canal No. 2	Canal No. 3	Canal No. 4	Canal No. 5
1	C.C.A. (acres) ..	961	2,963	2,550	3,498	188
2	Annual proposed Irrigation (acres) ..	466	1,193	1,004	1,490	92
3	Discharge (cusecs) ..	5.18	15.76	13.05	18.14	0.94
4	Length (miles) ..	2½	7	2½	6½	1½

2.91. Before the construction of tank most of the land in its command was a saline patch. It has now mostly been converted into good irrigable land except for 14 villages which are still reported to be saline.

2.92. The performance of the project for the last 7 years is—

		1957-58	58-59	59-60	60-61	61-62	62-63	63-64
Rainfall	..	44"	26"	25"	40"	24"	19.6"	21.65"
Max. tank gauge	..	12.5'	11.5'	15' (full)	11.75'	8.3'	11.2'	8.5'
Live Storage impounded (m. cft.)	..	465	388	635	405	190	370	220
Actual irrigation (acres)	Kh.	1,575	1,087	923	1,808	389	282	N.A.
	Rabi	1,049	1,561	1,701	1,245	1,628	2,412	N.A.
	Bed	84	..	..	..	210	171	..
Total	..	2,708	2,648	2,624	3,053	2,227	2,865	N.A.

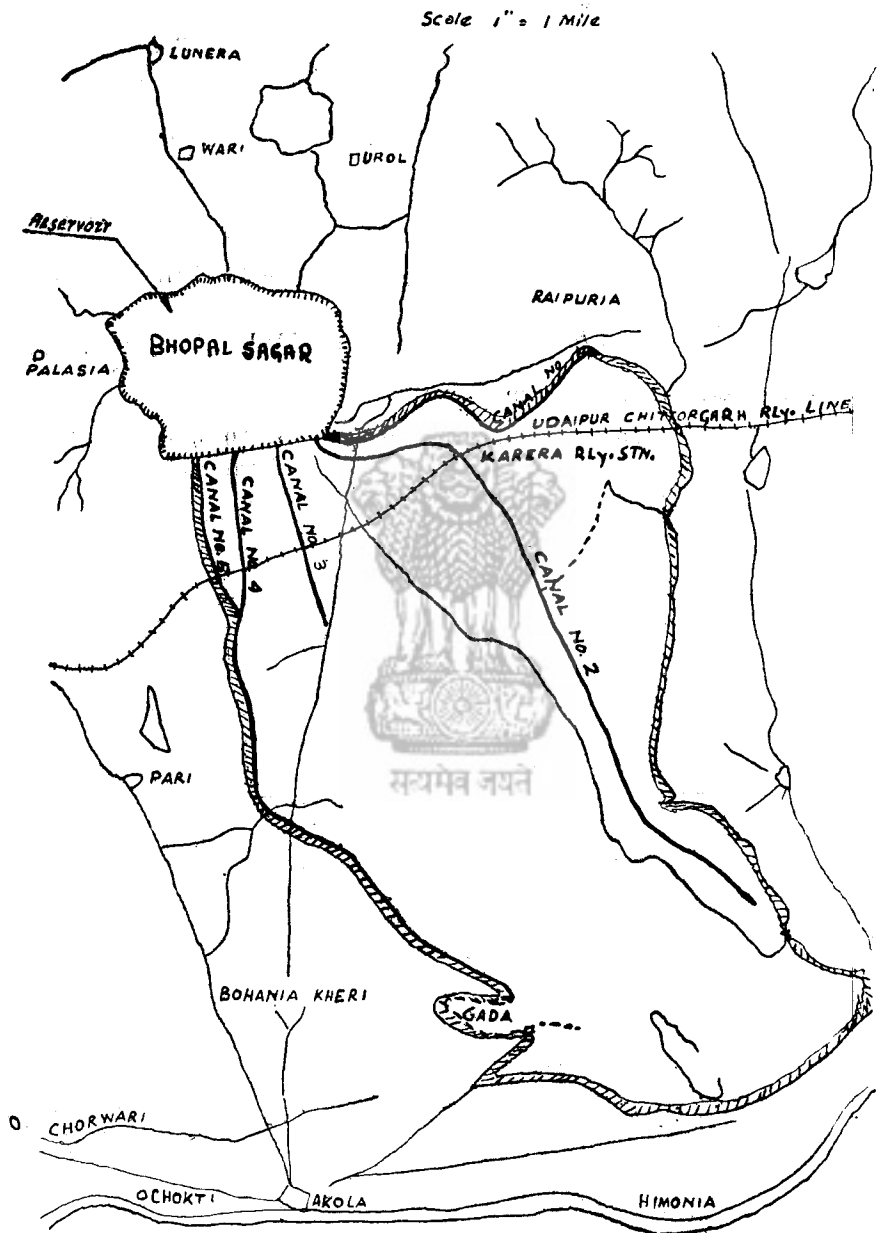


Fig. 2.2—Index Plan of Bhopal Sagar.

2.93. The above figures show that even in 1959-60 when the tank got full, the actual irrigation was only 2,624 acres against 4,245 acres proposed. In fact a tank with a live capacity of 635 m. cft. should be able to irrigate much more than the proposed area of 4,245 acres. The utilisation on the project, it is felt, can be improved by rationalisation of outlets, introduction of intermittent running of canals and change of crop pattern to achieve optimum use of supplies.

2.94. At present the most predominant irrigated crops on the system are wheat in *rabi* and sugarcane in *kharif* which is clear from a sample study of canal No. 2 which irrigated 778 acres in 1962-63. Out of this 743 acres were irrigated in *rabi* and only 35 acres in *kharif*. The area under wheat was 632 acres, under barley 29.5 acres, under sugarcane 31 acres and under rice 4 acres while there was no oilseed crops and gram was only 0.5 acres. A change-over to pulses and oilseeds may prove more economical and paying to the cultivator.

2.95. Field studies given in the foregoing paragraphs go to show that in most of the cases the tanks and reservoirs are not serving the areas to the extent they are supposed to. The reasons, therefore, can be summarised as below:—

- (a) Inadequate technical competence having been applied to lay out a proper distribution system including watercourses and field channels.
- (b) Excessive use of supplies available. This may be partly due to ignorance of the cultivators with regard to the correct dosage of water needed for the crops at different stages of their maturity.
- (c) Lack of motivation on the part of cultivators to get irrigation completed in time. Indifference to irrigation at night is a clear indication of that.
- (d) Liberal running of canals continuously is conducive to wastage of water. This should be avoided. Besides a rationalised outlet ventages, there should be a properly scheduled regulation order for at least sizeable tanks and reservoirs based on supplies available and areas and crops to be served.
- (e) Dual control of Irrigation and Revenue Departments is not conducive to optimum use being made of the irrigation supplies available. Small saving in establishment expenditure, if any, cannot offset the loss otherwise incurred in irrigation revenues and more so in overall production from the areas irrigated.
- (f) Since losses from tanks in dry part of the season are heavy, it may prove to be advantageous to subject the available supplies to early use-up. This is possible if cropping pattern is changed from late maturing crops to early maturing crops, as far as possible.

CHAPTER III

SUBMERGENCE TANKS AND BUNDIES

3.1. Function of submergence tanks is to store monsoon water into the tank and let it soak into the soil. Where they are shallow the tank bed usually gets dry by the time the *rabi* sowing season starts. They therefore provide soft bed for sowing of winter crops. They are therefore generally called submergence *bundies*.

3.2. Submergence tanks of comparatively higher depths and larger catchments, wherein the entire water collected is not likely to be absorbed in the bed, are provided with sluice gates and spillovers. The emptying of such tanks is usually started towards the end of September so that land in the bed of the tank becomes fit for ploughing and *rabi* sowing during the second half of October. The escaped water wherever possible is utilised for '*palewa*' (pre-sowing) irrigation or for last watering of maturing paddy crops if any in the areas outside the tank *bunds*.

3.3. Sometimes the submergence tanks are built in series one emptying into the other. In such cases even in years of scanty rainfall when all the tanks do not get filled up (because they all depend on the one and the same catchment), the area protected is comparatively large although the sowing in the bed of the lower tanks is delayed to some extent.

3.4. Such submergence tanks and *bundies* are quite popular in Alwar and Bharatpur districts of Rajasthan because of suitable topographic and soil conditions. They also exist in the adjoining Agra district of U.P. They are generally constructed in areas where the soil is clayey which retains moisture. These soils produce satisfactory *rabi* crop with the moisture so retained without any additional irrigations excepting that which is usually provided by a few winter showers.

3.5. Indirectly these works also help in sweetening the subsoil brackish water and in maintaining the supply of the wells in the bed and in the adjoining areas. Such works are comparatively inexpensive and have been in vogue for a long time. They consist chiefly of embankments or *bunds* constructed along a contour or across a shallow depression with the object of impounding spill waters from neighbouring torrents and from local catchments. Besides providing moisture for the *rabi* sowing these submergence tanks also fertilize the soil by the deposited silt.

3.6. Usually a flat rate, irrespective of the crop sown, is charged for such submergence. In some cases there is no separate irrigation rate and land revenue rates fixed in the settlement are supposed to include the levy for the irrigation advantage. Submergence areas are known as "*Sairabi*" areas in Rajasthan. The submergence tanks and *bunds* are also categorised the same way as the storage and diversion *bunds*, dealt with in Chapter II, para 2.3 as far as their maintenance, regulation and assessment are concerned.

3.7. The Team during their visits to different parts of the State, inspected a few of these submergence *bunds*. Their location is marked on the index map at Fig. 3.1. Case studies pertaining to them are given in the following paragraphs.

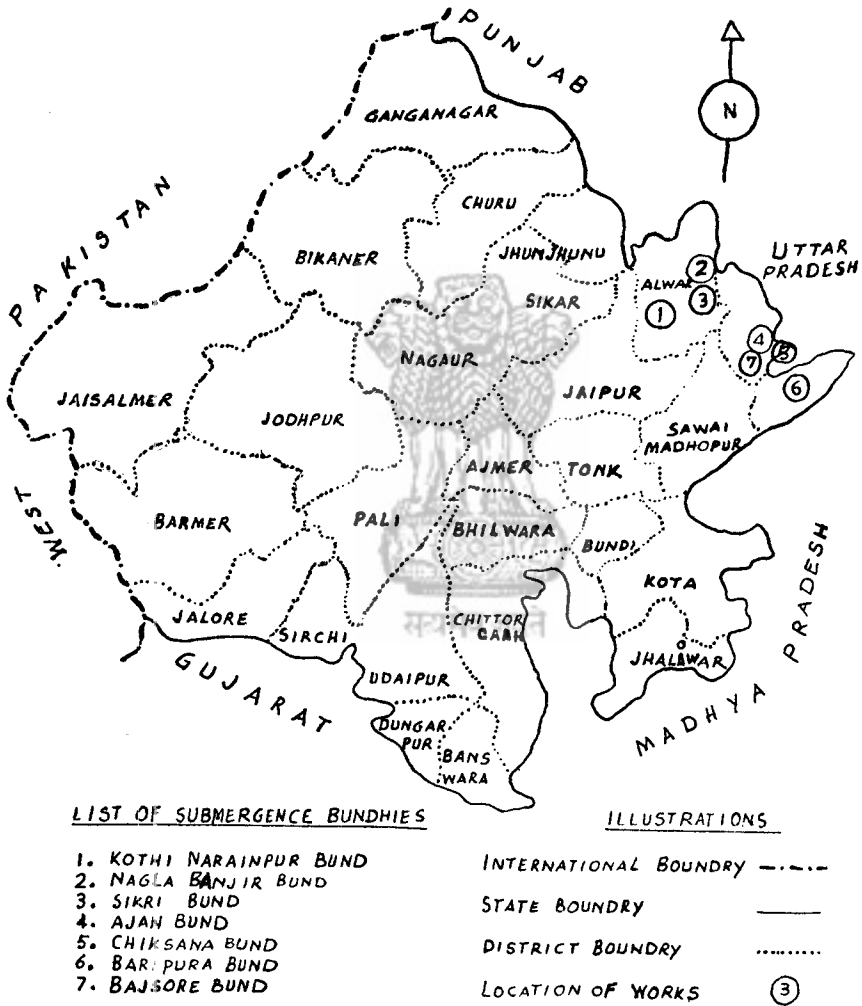


Fig. 3.1—Map showing Locations of Submergence Tanks and Bundies.

Kothi Narainpur Bund

3.8. This *bund* (1,770 ft. long) situated about 20 miles south of Alwar in village Moonpur, *Tehsil* Ramgarh was completed in 1962-63 under III Five Year Plan. The *bund* was expected to submerge an area of about 92 acres and to irrigate 170 acres of outside area annually. Actually the soil in the bed of the tank is said to be of non-retentive type and consequently no water has ever accumulated there. Luckily the off taking canal of 5.17 cusecs which was provided in the scheme has not been constructed so far. The work originally is reported to have been taken up by a Social Welfare Society. Later on without proper completion it was transferred to irrigation Department and they spent Rs. 20,000 on its completion. Evidently the scheme was taken up without adequate investigation. Had the soils of the tank been tested before project formation such infructuous expenditure would have been avoided.

Nagla-Banjer Bund

3.9. This submergence *bund* is situated 9 miles east of Alwar in village Nagla Banjer in *Tehsil* Ramgarh. It is an old tank, which was reconditioned in 1st Five Year Plan period at a cost of Rs. 54,339. Its catchment is reported to be 55.2 sq. miles. Its total length is 7,000 ft., average height about 12 ft. and the submergence expected annually is 2,000 acres. The *bund* is provided with two sluices and a spillway. Against the target irrigation of 2,000 acres the actual figures reported to have been achieved are—

Year					Area recorded (acres)
1956-57	..	..	..	..	150
1957-58	..	..	..	..	176
1958-59	..	..	..	..	9
1959-60	..	..	..	..	146
1960-61	..	..	..	..	275
1961-62	..	..	..	..	356
1962-63	..	..	..	..	358
1963-64	..	..	..	..	Nil

Apparently these figures do not reflect the areas actually benefited. Possibly this may have been done with a view to avoid assessment.

3.10. The system of assessment on this tank for bed submergence therefore needs looking into. The *Zilladar* who met the team at site could not explain it clearly. From what the team gathered, rate varied with each field according to the condition of crop on it, as assessed by the *Patwari*. The assessment system needs to be rationalised so that a flat rate is levied for the submergence as elsewhere in the State.

3.11. At the time of team's visit the *bund* was lying breached. It was stated that some cultivators who wanted to clear their lands of the submergence made the cut even when the tank gauge was only 8.5 ft. against the maximum permissible gauge of 9.0 ft. No legal or punitive action appears to have been taken against the persons responsible for the cut.

3.12. The main reason for this slackness appeared to be the dual control on the tank by the Irrigation and Revenue Departments, the assessment being with the Revenue Department and the maintenance and regulation with the Irrigation Department. The breach which could have been closed soon after the occurrence was still lying unrepaired at the end of November.

Sikri Bund

3.13. This is an old inundation system of tanks in the catchment of river Baran near Nagar town between Alwar and Bharatpur. The river supplies and the local rainfall run-off of the area is diverted through small channels along the Sikri contour *bund*. The *bund* which forms left bank of the channel running parallel to the *bund*, is provided with pipe outlets for outside irrigation. The irrigation figures from the system (for the last 8 years) are reported to be—

Year					Kharif	Rabi	Bed	Total
1956-57	..	..	..	..	..	32,256	..	32,256
1957-58	..	..	..	..	5,298	16,782	..	22,080
1958-59	..	..	..	..	3,899	21,887	..	25,786
1959-60	..	..	..	..	1,729	6,665	..	8,394
1960-61	..	..	..	..	5,380	20,263	..	25,643
1961-62	..	..	..	..	2,446	11,510	2,247	16,203
1962-63	..	..	..	..	1,665	8,255	1,414	11,334
1963-64	..	..	..	..	1,405	16,638	1,060	18,503

3.14. It is a big system of inundation irrigation but appears to be poorly maintained. The regulation is not done properly. There are no water-courses for outside irrigation. The water appears to be used wastefully. It should be possible to bring the system up-to-date and control it scientifically so that the supplies available from the *nadi* and the catchment are put to optimum use.

Ajan Bund

3.15. The *bund* is situated about six miles south of Bharatpur town. It was originally constructed about 70 years back and was reconditioned in the 1st Five Year Plan period at a cost of Rs. 2.82 lakhs. The *bund* is about 12 miles long. Its maximum height is 16 ft. and its storage capacity is 2,500 m. cft. It intercepts the spills of the Banganga river. The area submerged at full tank level is 10,240 acres. Besides submerging inside land, the *bund* also provides irrigation to about 12,000 acres of outside land through outlets and four channels taking off from the *bund* besides several waste weirs and spillways. They are fitted with sluice gates and are also used for feeding the lower tanks.

3.16. Outside irrigation takes place both during the rains whenever there is water to spare and also after the rains when the tank is emptied to

prepare the inside land for sowing. The areas irrigated during the five years ending 1960-61 are reported as below:—

1956-57	..	..	..	..	18,499 acres
1957-58	..	..	..	..	18,913 ..
1958-59	..	..	..	..	18,123 ..
1959-60	..	..	..	..	18,234 ..
1960-61	..	..	..	..	22,646 ..

It is quite a satisfactory system of irrigation for areas roundabout Bharatpur town. The *bund* is well maintained but the condition of offtaking channels needs improvement.

3.17. To increase the yield of crops from such submerged areas, the feasibility of sowing green manure crops therein with the advent of rains in June and ploughing it by the beginning of August when the rain water starts collecting may be looked into. There is also possibility of drilling wells in the tank bed which could improve the yields from *rabi* crops by ensuring them subsequent irrigations if the quality of sub-soil water is good.

Chiksana Bund

3.18. This *bund* is located in village Chiksana about 11 miles from Bharatpur towards Agra near the Rajasthan—U.P. border. The *bund* is 1,700 ft. long with a maximum height of 19 ft. and the maximum water depth of 12 ft. It is mainly filled from the waters of Ajan Bund through Chiksana Canal which is 8 miles long, 50 ft. wide with a capacity of 572 cusecs. Moti *jhil* and Bharatpur town also drain into this tank through Girraj Canal.

3.19. It too is an old work of the erstwhile Bharatpur State's time. Due to insufficient escape provision it breached many a time in the past. During 1st & 2nd Five Year Plans a new escape head with increased waterway has been provided and the *bund* has also been strengthened. Now it is stated to be functioning satisfactorily. The area benefited in the five years ending 1960-61 is reported as:—

1956-57	..	..	..	..	3,843 acres
1957-58	..	..	..	..	2,122 ..
1958-59	..	..	..	..	3,398 ..
1959-60	..	..	..	..	819 ..
1960-61	..	..	..	..	2,153 ..

3.20. The suggestion made in para 3.17 above regarding sowing of green manure crops in the submerged areas may be tried in this tank also. Here it may succeed still better as this tank depends mostly on Ajan Bund waters and naturally gets filled late.

Baripura Bund

3.21. This submergence *bund* is located in village Baripura, 10 miles South-west of Dholpur *tehsil*, Bharatpur district. The *bund* is provided with a spillway and an escape sluice. The *bund* is reported to have been completed in 1958 and is designed to provide submergence to 150 acres. But the sluice abutment was damaged in July 1963 and is still lying unrepaired with the result that the *bund* is not able to hold water. The cultivators of the area are asking for early repairs to the damaged work.

3.22. For 1958-59 and 1959-60 only 4 acres benefited area is reported from this tank. The local officers concerned have not been able to supply information regarding the cost of the work and reasons for its extremely poor performance. It needs looking into.

Bajsore Bund

3.23. This is an old *bund* of the princely times, about 2,000 ft. long and 15 ft. high situated in Bajsore village about 14 miles south west of Baretha town in Biyana *tehsil* of Bharatpur district. It is provided with a masonry sluice. The *bund* is lying neglected and unrepaired and is out of use. It has not been taken over by the Govt. nor by the *panchayat*. The real cause for this neglect needs to be looked into and if the soil is of retentive type and has sufficient catchment to benefit its bed area, the feasibility of restoring this old neglected work may be investigated.

3.24. The system of submergence tanks may prove to be economically not remunerative. But in water scarcity areas it provides a means for conservation of rain water and its use for agricultural purpose which may otherwise just roll away into the streams. It has the added advantage of helping soil conservation. It would, however, seem advantageous if the embankments are provided with some suitable type of plantation. That will save the embankments from erosion and will as well provide fuel and wood.



CHAPTER IV

RAPATS AND WELLS

4.1. In 1961-62 out of a total 45.05 *lakh* acres of irrigated area in Rajasthan 24.15 *lakh* acres (*viz.* 53.6 per cent) were irrigated from open-wells, 14.36 *lakh* acres (31.87 per cent) from Govt. Canals and the remaining 6.54 *lakh* acres from tanks and other sources. These figures indicate the relative magnitude and importance of well irrigation in this State.

4.2. As mentioned in Chapter I, the soil and rainfall conditions in Rajasthan are such that in greater part of the State, arid and semi-arid conditions prevail. Consequently the sub-soil water level is generally deep. Water found is very often brackish and slow in recoupment. In some districts such as Bikaner, Sriganganagar, Jaisalmer and Churu irrigation wells are practically non-existent. In many areas they have to pierce through rocky strata to get water from wells in rock fissures. Usually it is never certain that sweet water in sufficient quantity will be available even after deep sinking and cutting through the rocky sub-strata. The cost of constructing an open well in the State is therefore normally higher than what it is in many other States, while its chances for success are meagre.

4.3. Table 4.1 shows the position of irrigation wells in each district of the States—

TABLE 4.1

Serial No.	District	Total No. of wells	No. of wells in working order	No. of wells out of order	No. of wells lying incomplete
1	2	3	4	5	6
1	Bikaner ..	3	1	..	2
2	Churu ..	169	103	47	30
3	Sriganganagar ..	9+17 (Tubewells)	1+4 (Tubewells)	5	10 (Tubewells)
4	Alwar ..	11,742	11,818	1,859	284
5	Bharatpur ..	29,387	19,238	8,784	1,919
6	Jaipur ..	90,717	72,867	17,850	8,159
7	Jhunjhunu ..	6,579	5,227	2,108	699
8	Sawai Madhopur ..	29,165	21,259	5,811	1,883
9	Sikar ..	18,328	13,374	4,652	408
10	Tonk ..	28,536	21,897	7,011	394
11	Ajmer ..	50,411	38,114	9,203	3,930
12	Barmer ..	3,498	2,863	635	188
13	Jaisalmer ..	156	93	63	10
14	Jalore ..	15,155	11,781	2,572	1,612
15	Jodhpur ..	6,698	5,091	1,323	515
16	Nagaur ..	13,111	6,893	6,068	288
17	Pali ..	30,538	24,847	5,496	1,639
18	Sirohi ..	9,612	7,294	2,003	499
19	Bundi ..	16,903	12,805	2,807	1,344
20	Jhalawar ..	31,246	22,614	8,521	3,137
21	Kota ..	21,492	14,443	5,314	3,661
22	Banswara ..	9,988	5,728	2,754	2,630
23	Bhilwara ..	75,164	55,337	15,011	11,290
24	Chittorgarh ..	26,858	21,547	5,042	1,634
25	Dungarpur ..	9,209	4,356	3,977	2,843
26	Udaipur ..	82,934	64,308	14,752	10,663
Total		6,19,608	4,53,889	1,33,680	58,659

4.4. Average annual irrigation per well is usually about 5 acres, 2 acres in *kharij* and 3 acres in *rabi*. Use of persian wheel is not common. Mostly people use *charsa* (leather bucket) for lifting the water. On some wells with bigger diameters and copious supplies, two *charsas* are worked simultaneously. Most of the wells, due to their poor recoupment, cannot be worked continuously. They can be worked only for 4 to 6 hours per day; especially in rocky sub-strata where they receive water through fissures in the rocky formations of their beds and sides.

4.5. To improve supply in such wells in rocky sub-strata there is a practice of constructing *Rapats* in some area more particularly in Ajmer region. *Rapats* are small masonry weirs put across small local streams so that the rainwater does not flow away quickly but is headed up by the *Rapat*. The headed up water is slowly absorbed into the soil thereby improving the supply in the wells of the adjoining areas.

4.6. The Team during its visit to the State inspected few *rapats* and open wells as marked in the index map (Fig. 4.1) and described in the following paragraphs.

Mangliawas Rapat

4.7. This *Rapat* is located in village Mangliawas, *tehsil* and district Ajmer across a local drainage channel. It is about 11 miles from Ajmer on Ajmer-Beawar road. The *rapat* is 120 ft. long and 5 ft. high above the stream bed level. It is built in stone masonry with vertical face and the rear slope of 0.7:1. The top width is 2.5 ft. The *rapat* was completed in March 1962 at a cost of Rs. 22,520. The *rapat* was expected to benefit 25 wells of the village, by raising their sub-soil water level. The pond capacity above the *rapat* was originally computed as 0.6683 M. cft.

4.8. The officers in charge had no record of water levels in the wells for the pre-*rapat* construction and the post-*rapat* construction periods to show how much rise of sub-soil water level, if any, had actually taken place or what was the increase in irrigated area from the wells concerned. The officials concerned were, however, satisfied (on the basis of their talks with local people) that the *rapat* was serving the purpose it was meant for. At the time of inspection (on 27-9-64) a small quantity of water was overflowing the *rapat* and the pond was full. Its back water appeared to extend to about 1,500 ft. upstream. There were signs of silting up of bed upstream of the *rapat*. It is desirable that in such cases a record of rise in subsoil water level, increase in well irrigated area and the progress of silting upstream of the *rapat* is maintained, so as to assess the real benefit and its duration. Necessary proformas thereabout need to be laid down.

4.9. It is felt that the advantage of *rapats* cannot be permanent. It may, at the most, last a few years till the small pond created by the weir gets silted up to the top of the crest. It is for consideration if such works need be constructed at Government cost as done in this case, especially when no cess or water rate is charged from the beneficiaries.

4.10. In this case, even if an additional irrigation by each well as a result of the construction of the *rapat* is taken as 3 acres, the maximum benefited area could be 75 acres only. The cost per acre benefited will thus work out to about Rs. 300. If the advantage lasts for 5 years, the expense per acre per year will be Rs. 60 in addition to the cost of Working the well

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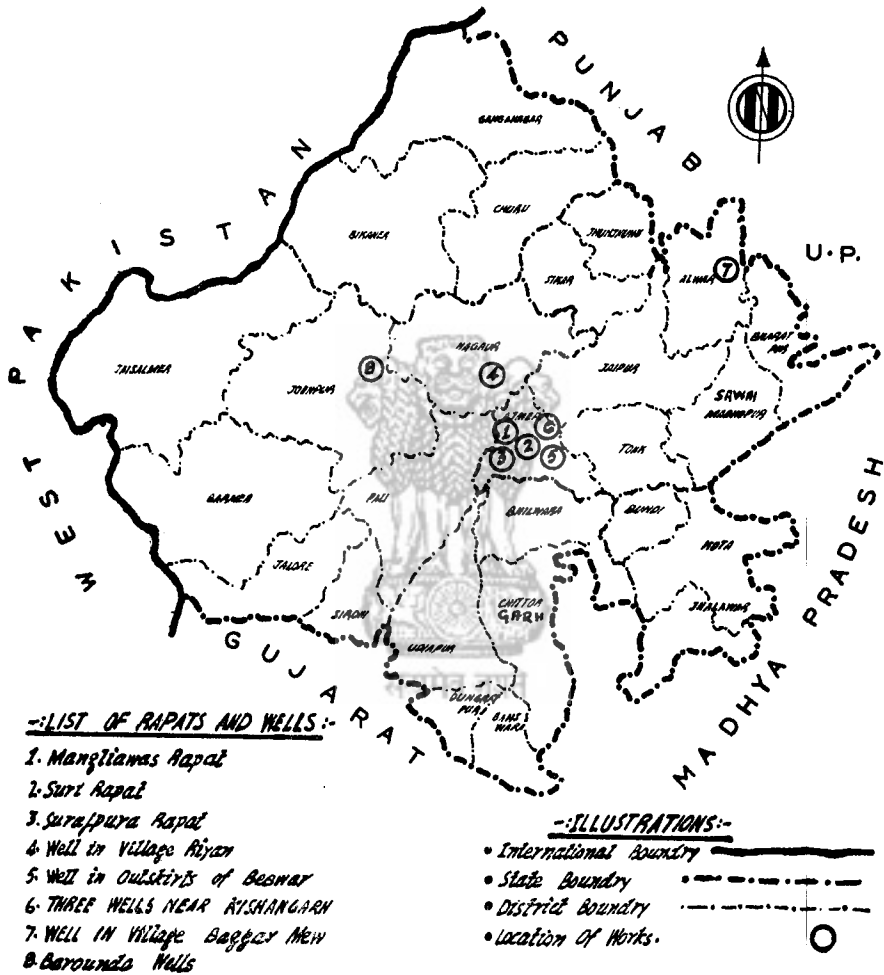


Fig. 4.1—Map showing Locations of Rapats and Wells.

etc. The economics of such works may be worked out to see how far the extra yield of crops derived justifies expenditure of public money on such works with temporary advantages. It may also be seen, if some sort of cess per well can be levied in such cases.

4.11. The feasibility of constructing *rapats* cheaply without cement *e.g.* trangers or crates filled with boulders or rough stones *etc.* may also be looked into.

Surajpura Rapat

4.12. This *rapat* is built on a *nala* in village Surajpura about 4 miles to the left of mile 20 of Ajmer Beawer Road. It is flanked by hills on both sides and has a catchment of 1.0 sq. mile. The *rapat* sill is 16 ft. high above the bed of the *nala*. It was completed in October 1963 at a cost of Rs. 19,703. The capacity of the pond upstream of the *rapat* was estimated to be 2.0 M. cft.

4.13. In 1963, due to scarcity of rains, practically no water collected upstream of the *rapat*: In 1964 on 27-9-64 when the site was visited, there was no water in the pond, although the Team was told that it had filled up to the sill level in August and early September. The condition of the bed upstream of the structure showed that it had silted up by 5.0 ft. after the completion of the *rapat*. Now the bed was only 11 ft. below the crest level. The masonry of the weir was undermined at two places through, which water was leaking. Evidently the foundation was not properly laid.

4.14. Local cultivators in the area downstream of the *rapat* told that the *rapat* had benefited their wells considerably. Local enquiries and site inspection showed that the water level in the wells had generally risen by about 7 ft. The cultivators stated that previously they did very little well irrigation while this year they had irrigated their *khari* crops once in August and were planning to have a second crop of *rabi* (wheat) in their fields and hoped to get good yield. However, no authentic data was available. The observations made in paras 4.8 to 4.11 apply to this work also.

Suri Rapat

4.15. This *rapat* was constructed in 1960-61 by the *Panchayat* of Nai-Kalan at a cost of Rs. 10,810 which was given by the Block as grant-in-aid. The catchment is reported as 1.22 sq. miles. It is mostly hilly and the *rapat* is between two hillocks. The *rapat* is 146 ft. long and about 5 ft. high. The capacity of the pond was estimated as 0.53 M. cft. only. The wells downstream of the *rapat* are stated to have benefited appreciably. The catchment being mostly hilly there was not much silting of the pond. So far it was stated to have silted up only by 0.5 ft.

4.16. On 27-9-64 when the *rapat* was inspected the pond upstream was full and some water was overflowing the crest. It was told that previously 55 acres used to be under wheat in the area served by the *rapat* but now 85 acres were being sown with wheat. Similarly improvement in the area and yield of other crops was also reported. The water level in the wells

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was reported to have come up by about 10 ft. Now it was 8 to 10 ft. below ground level. The B.D.O. told that there was considerable improvement in the general economic condition of the inhabitants of this village due to the construction of the *rapat*.

OPEN-WELLS

Well in village Riyan district Nagaur

4.17. The Team visited a well on the road from Nagaur to Ajmer. The water level in the well was about 60 ft. below ground. The water was not saline. Its recoupment too was reported to be satisfactory. The owners have 20 acres of land and irrigate 7 to 8 acres by the well in each crop i.e. about 15 to 16 acres annually. The land in the locality is good fertile alluvial type and the cultivators appeared hard-working. The general condition of their crops was good. They owned three pairs of bullocks and their economic condition appeared to be fairly satisfactory. Besides the usual maize and *bajra* crops in *kharif* and wheat and barley in *rabi*, they were growing chillies and vegetables also.

4.18. The Team feels that construction of more wells in this tract is feasible. The cultivators of the locality need to be encouraged in this respect by grant of *tacavi* loans and even subsidies where necessary. Replacement of *charsha* system of lifting water by iron persian wheels may also be encouraged. This will be economical as it will save manual labour, which is usually scarce in Rajasthan.

Well in out-skirts of Beawar town in Ajmer district

4.19. This is a new well completed in 1963. It belongs to one Shri Kishanlal. The well, 12 ft. in diameter, is nearly 75 ft. deep and has pierced the under rock. It was stated that the well cost Rs. 5,000 to build, out of which Rs. 1,500 were advanced by the local *Panchayat*. The water in the well was not ample. Its recoupment was also very slow. The *charsha* could not be worked continuously for more than 3 hours in 24 hours. This area is well known for its tomatoes, which are exported in truck-loads to Delhi. But due to poor water supply the condition of crops on this well was rather poor, even though the cultivated area too was quite small, hardly about an acre.

4.20. Apparently the well did not strike any good water bearing fissure. Besides it was located just within 30 ft. of another deeper well which had ample water and was being worked by a pumping set. The owner stated that the waters of the two wells were not connected and that he had constructed his well after consulting a water-diviner. The Team, however, feels that location of new wells so near to existing wells should ordinarily be discouraged, especially in places where the underground water is generally scarce.

Wells near Kishangarh

4.21. Three wells were visited on the southern outskirts of Kishangarh town (*tehsil*) in Ajmer district. They belonged to (i) Shri Bijaji, (ii) Shri Hari Chand Kantarya and (iii) Binjia Gujar. All the three wells are built in stone masonry. The spring level in all the three wells was about 25 ft. below ground. They are about a furlong apart from each other.

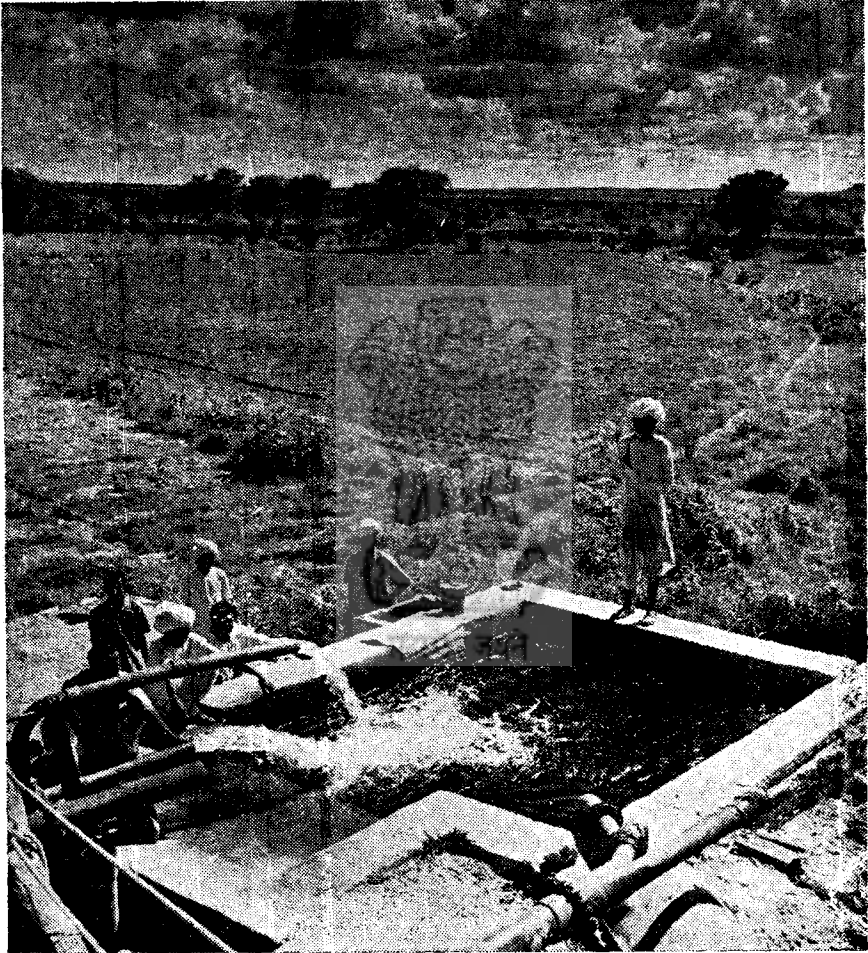


Fig. 4.2—A Bourunda Well in operation.



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4.22. Well No. (i) is worked by *charsa* and No. (ii) by 5 H.P. diesel pumping set. The wells are about 50 years old. According to local standards the water supply in both these wells is fairly satisfactory. They can be worked for about 3 to 4 hours continuously and thereafter they have to be stopped for 2 to 3 hours to allow for replenishment. They were stated to be getting benefited by a *bund* known as "Selora bund" about 4 miles away. Condition of crops on both the wells was good. The area on well No. (i) is 4 acres which is mostly sown with vegetables while area on well No. (ii) is 15 acres which is mostly sown with maize, chillies, wheat and barley *etc.* It has also an orchard in one acre.

4.23. Well No. (iii) belonging to Shri Binjia too was an old well, which had fallen into disuse and was filled up. He said that he got a *tacavi* of Rs. 1,000 sanctioned and has carried out recently its re-excavation, deepening and repairs at a cost of about Rs. 2,500. The work was completed but so far the well had not been used for irrigation. The water of this well is brackish and is not under the influence of any *bund* or *rapat*. The owner was not happy and was afraid that the well water may not benefit his crops and instead may spoil his land. He was, however, preparing his fields to sow *rabi* and try the well irrigation. Had the authorities recommending *tacavi* loan, enquired into the causes of original abandoning of the well, the cultivator might have saved the labour and money put in its re-excavation *etc.*

Well in village Baggar-Alwar

4.24. An open well, in village Baggar Mew in district Alwar, which is located downstream of Nagla Banjir Bund was found fitted with a 10 H.P. Ruston (diesel oil) engine and pump. The water level in the well was only 10 ft. below ground while the well is 35 ft. deep. The well commands 12 acres of land. It irrigates about 11 acres in *rabi* and about 4 acres in *kharif*. The entire area is double cropped, with 8 acres in *kharif* usually depending on rain only. It is felt that similar good wells may be possible to construct in suitable areas below many *bunds* and even in the bed of many submergence *bunds*.

Bourunda-Wells

4.25. Some 50 miles away from Jodhpur near Bilara there existed some open wells in Bourunda village, which had never shown any sign of depletion or fall in their water level in the hottest period of the year, even on the maximum withdrawal. This created some craving in the minds of the cultivators for further exploitation. This quest for irrigation source, made the cultivators to deepen those existing wells and in the process they reached a point where copious supply of underground water was available.

4.26 There are at present seven such wells owned by private individuals and one of them is managed on cooperative basis. These wells irrigated a total area of about 5,570 *bighas*, with a total discharge of 4,11,650 gallons per hour. Half of the area under irrigation from these wells is served from one well alone, which is owned by Detha Bros. The discharge from this well is 2,05,000 gallons per hour and it is irrigating an area of about 2,500 *bighas*. Fig. 4.2 shows a photograph of this well.

4.27. The details of these wells in respect of area served and water drawn is as follows—

Owner's Name	Area irrigated by the well in the season (bigha)	Discharge (gallons per hour)	Depth	Power of the motor fitted in wells
1. Detha Bros.	2,500	2,05,000	120 ft.	215 H.P.
2. Cooperative well	1,000	85,000	120 ft.	115 H.P.
3. Man Singh Hera Lal Prata Bhakar	1,200	85,000	120 ft.	110 H.P.
4. Moola Ram Mali	600	35,000	120 ft.	60 H.P.
5. Madho Singh Bharun Sagar	90	500	145 ft.	10 H.P.
6. Gangaram Mali	100	550	125 ft.	10 H.P.
7. Pewaram Berira Lal Ugraram Badiar	80	550	100 ft.	10 H.P.

4.28. The Team had occasion to visit this valley and particularly one well of Detha Bros. The discharge from this well is 2,05,000 gallons per hour. The well is fitted with pumping sets with 3 motors of 100, 60, and 55 H.P. each and the water is led out through 3 pipes of 8", 4" and 4" dia. each.

4.29. Since these wells are private owned the Irrigation Department neither levies any charge over water thus drawn, nor looks to its utilisation. As gathered from Detha Bros., the water is supplied only to those cultivators who agree to pay a part of their produce in return for the water supplied. Usually it varies from $\frac{1}{2}$ to $\frac{1}{3}$ of the total produce depending upon the No. of waterings taken by each crop. The water is distributed through *pucca* water courses. It is the responsibility of Detha Bros. to maintain these channels. They also look after the proper maintenance and operation of the pumping sets. The cultivators appeared to be satisfied with this arrangement.

4.30. Bourunda village lies within the range of Luni river catchment. The river dries up in winter season while during rainy season it gathers good amount of water most of which disappears in the upper reaches of the river. It may be that the water from Luni river forms the main source of this underground water which gets stored and absorbed in the underground rocks and fissures around Bourunda and enriches the underground reservoir in this zone. During rainy season the water level in these wells rises by about 7 ft.

4.31. Further exploration of the underground-water-source in areas adjoining Bourunda village along the course of Luni river is suggested as similar high yielding open wells may be possible elsewhere also in this valley.

4.32. The possibility of lifting water from these wells by wind-mills may also be investigated. The water being abundant and the area being open and arid with high winds, it may be possible to work the smaller wells with wind-mills, which do not cost much to instal and are inexpensive to operate.

Deep-Tubewells

4.33. Rajasthan Govt. has an underground-water-development board. They have carried out explorations in many parts of the State. Their reports containing the results arrived at so far, could not be had by the Team. However, while visiting Rajakhera area (in Bharatpur district) adjoining

Agra district of U.P. on the right bank of river Uttangan, the team learnt from the B.D.O. Rajakhhera Block that three trial borings in his area had been successful. But they were lying unutilised for two years and no pumping sets were fitted on them nor any irrigation channels *etc.* laid. The Team also learnt that some correspondence was going on between the Govt. and the *panchayats* concerned whether they were willing to pay Rs. 40 per acre of irrigation from the tubewells. The particulars of the three borings are—

Boring No.	Location	District	Depth of S.W. level	Boring depth	Discharge (G.P.H.)	Depression head
X	Silawat	Bharatpur	61 ft.	440'	35,400	12'
XI	Jagmohan Pura	"	71 ft.	442'	25,400	12'
XII	Devkhara	"	55 ft.	497'	24,000	15'

4.34. It is learnt that similar successful borings have been made in some other parts of the State also *e.g.* one in village Chikani in Alwar district. The Team feels that commissioning of these and such other tubewells should not be delayed for want of undertakings from the cultivators. They should be treated as experimental tubewells and energised and run even on subsidised basis if necessary to see how they behave under actual working conditions. If their working is found steady, more tubewells can be tried in the tracts adjoining them. In a water scarce tract like Rajasthan, it may be worthwhile to have State tubewells for irrigation even if they yield only about 15,000 to 18,000 gallons per hour against the usual criteria of 25,000 and above in other adjoining States.

4.35. *Rapats* can be had in Rajasthan in only a few areas, where physiography of land is favourable. Their utility is only periodic. Besides assessment of benefits accruing from *rapats* can be only in general terms. They can, therefore, be best handled by *Panchayat* institutions, with regard to their construction, upkeep and maintenance.

4.36. But, indiscreet expansion of *rapat* programme has to be guarded against. In some places, demands for more *rapats* in upper reaches have to be resisted in the interest of areas located in lower reaches. Quite often, people show a keenness to impound water for their own-use in upper reaches with complete disregard towards claims of people, who may have established dependence on the run off so obstructed. There have been instances where irrigation works operating over number of years have been rendered in-effective because of indiscreet construction of *rapats* in the catchments feeding those works. This results from incomprehensive planning of water-use on watershed or complete catchment basis.

4.37. Areas, where open percolation wells can be successfully built are only limited. There is generally good use made of these wells. But, number of these wells could be increased in many areas, where quality and quantity of sub-soil water is re-assuring. Here too, indiscreet expansion needs to be avoided, because the general pattern of the terrain is that of water scarcity.

4.38. Greater coordination is called for between groundwater organisation of the State and Irrigation and Agriculture Departments. Where deep borings have been made and results have been found satisfactory, no time need be lost in harnessing the resources tapped for their fullest possible use of increasing agricultural production from our land and water resources.

CHAPTER V

PLANNING AND PROSPECTING

5.1. Rajasthan among the States of Indian Union has the widest variations in its rainfall pattern. It varies from an average annual precipitation of less than 5 inches in the Thar desert near Jaisalmer to more than 35 inches in South eastern parts of the State. Plan of irrigated agriculture in the State has naturally to be widely varying from region to region.

5.2. Physiographically too there is considerable variation in different parts of the State. In fact, the water shed lines as run through the State divide the State into distinctly varying physiographic units. These divisions are indicated in the map at Fig. 5.1.

5.3. In the western and north-western arid regions greatest possible stress has to be laid on conservation of whatever little moisture nature provides. Tanks and reservoirs wherever exist have to be kept under perfect maintenance. It may seem worthwhile to organise special water watch and inspection units for all such resources natural or artificial, more particularly in the arid region so that any neglect in this sector is located and remedied promptly.

5.4. The eastern region of the State bordering on Uttar Pradesh and Delhi has a rainfall pattern practically of the same type as in the districts of Agra, Mathura and Delhi. Since the topography is slightly undulating a system of submergence irrigation has developed in that area. Possibilities of extension of this system in other parts of the State need to be investigated, as the cost involved is low and the maintenance is also not very heavy.

5.5. Steps could also be mobilised for evaporation control from reservoirs or tanks surfaces with the help of mono monocular compound Cetyl Alcohol. Experimental work in this connection has proved successful in different parts of India. Its field use could be made with advantage in the arid and semi-arid regions of Rajasthan and considerable saving in water could be effected. At least in those tanks where water dries out by February or March, it could be retained till April or May or till the outbreak of next monsoon. That would be a great advantage. In this connection reference may be made to the Evaporation Control Unit of the Council of Scientific and Industrial Research.

5.6. A probe in Luni river basin to locate subsoil resources like those found at Bourunda village need to be mobilised. Such resources may also prove useful in providing water supply to villages in these areas apart from the advantage of irrigation.

5.7. As suggested by the Team during the course of their studies (*Appendix IV*) it may be worthwhile conducting rainmaking experiments in suitable locations so as to examine possibilities of augmenting natural precipitation wherever possible. In this connection Mount Abu is suggested as a suitable site for cloud seeding experimentation.

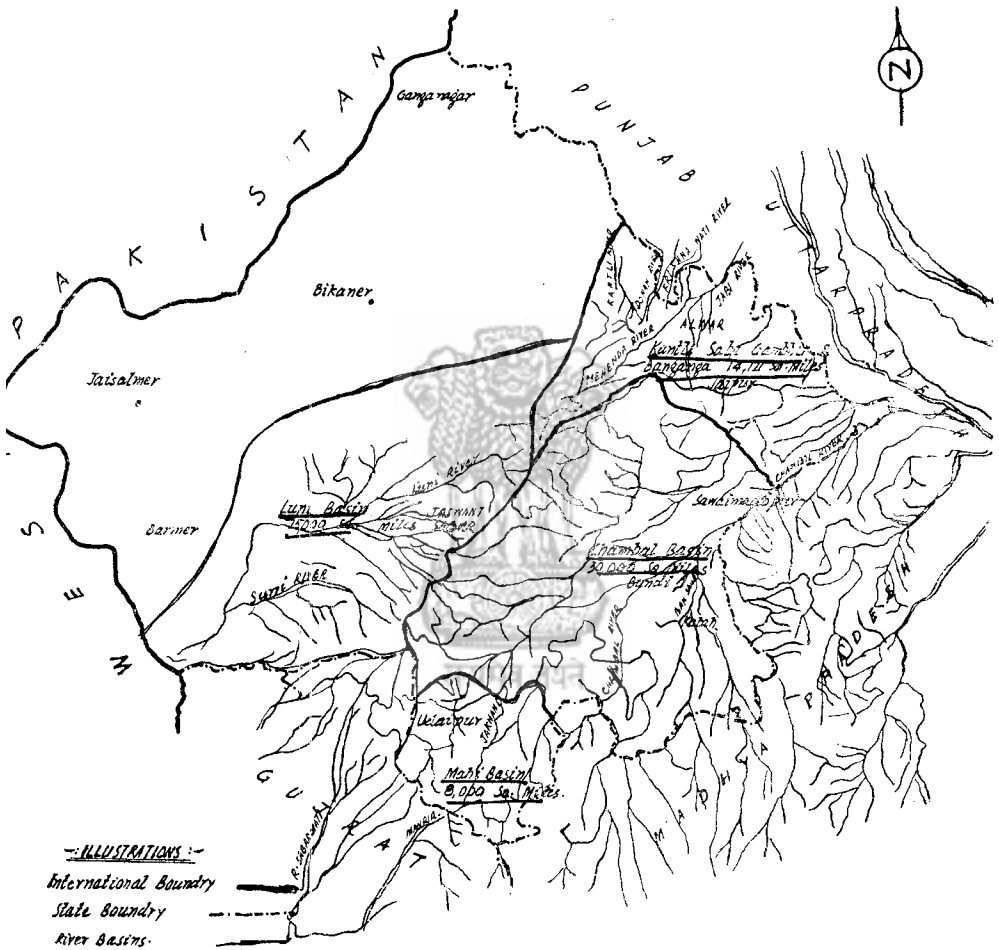


Fig. 5.1—Map showing River Basins in Rajasthan.



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5.8. Underground water survey and trial borings results will go a long way in finding out such areas where subsoil supplies exist. These results need to be made available to the Irrigation and Agriculture Departments as work progresses on trial borings. This will help the respective Departments in advance planning of agricultural operations based on subsoil supplies which could be made use of, as soon as they become available. Tracts like the one in Raja Khera in Bharatpur district seem to possess ample potentialities in this respect.

5.9. Water rates play an important part in the development of irrigation. If they are low the cultivators are prone to waste water. If they are too high there is reluctance on the part of the cultivators to have irrigation. Steps need to be taken to rationalise the water rates and unify them as far as possible. At present water rates are levied in different ways in different parts of the State as shown in *Appendix V*. In this connection an Enquiry Commission for the Water rates structure can be instituted, which could evolve a uniform pattern of irrigation rates in the State.

5.10. Irrigation legislation also needs to be looked into and amended so as to provide for a coordinated development of irrigated agriculture in the State. Rules and regulations have to be framed more particularly with regard to running of channels, which are in most areas run on continuous basis. Intermittent running of channels, more particularly during *rabi* season will go a long way in economising the use of water and will lead to better pattern of irrigated agriculture than what has been possible so far.

5.11. Outletting system on most of the irrigation works exists more or less on an *ad hoc* basis. It will be worthwhile localising areas getting irrigation benefits, assessing their water requirements for the ruling crops and fixing ventage of outlet on a rationalised and scientific basis as is done in the adjoining States of Punjab and Uttar Pradesh. Possibly imposition of *Osrabandi* to start with, will inculcate a sense of water conservation consciousness among the users and may be adopted universally in the interest of economic use of irrigation supplies by and large.

5.12. In most cases cropping is done on old conservative basis. Land capabilities survey needs be carried out in all such areas, as have the benefit of irrigation of one kind or the other so that cropping could be done to yield optimum advantage to the cultivators as well as to the State.

5.13. Trial-cum-demonstration farms will go a long way in indicating the best possible patterns in those areas, where irrigation has been introduced. These can be organised in the irrigators lands on a no loss basis to the cultivator. In other words cultivators could be assured that if they suffer any loss in the experimentation that will be made up by the State. In this way the idea of improved cultivation could be propagated.

5.14. Recording and assessment of minor irrigation is an important item in the development of irrigation from minor irrigation works. This has to be watched from year to year and an agency has to be made responsible for the optimum use of these supplies, more particularly in a State like Rajasthan where rainfall is not heavy and sometimes fails miserably. The most appropriate agency for recording such irrigation can be the Irrigation Department. That will enable the efficiency of irrigation officers at different levels to be judged as they will get related primarily

to the extent of irrigation secured by them through supplies available and will involve use of their technique of regulating the supplies and subjecting them to maximum possible agricultural use. It is worthwhile following this system even though it may involve an increased establishment cost.

5.15. Soil conservation aspect particularly in those areas which are hilly and where rainfall is heavier also needs to be looked into with greater attention than what has been possible so far. Contour bunding and *gulli* plugging has to progress on a programmed basis so that all such areas as are vulnerable to erosion are protected.

5.16. Detailed observations as emerge out of the field studies have already been made in the foregoing Chapters, where case studies have already been given after site inspection of individual works. Under "Planning and Prospecting" only such items have been given as have a generalised approach to different regions of the State and as could be dealt with at the policy making level with regard to development of irrigated agriculture in the State of Rajasthan.



RECOMMENDATIONS

Aridity is a prominent aspect of the climatic complex of Rajasthan. Conservation of water is, therefore, the mainstay of its agrarian economy. Some areas, in the western half of the State face extremely acute shortage of water almost every year. Irrigation accordingly occupies a significant place in agricultural development of the State. Techno-economic appraisal of its minor irrigation works, may thus invoke interest in their performance and consequent improvement. The Team's observations as contained in this report are based on actual field studies conducted on a number of sample works. But only such recommendations are listed below, as have generalised implications and impinge directly on policy matters.

I. A schedule of periodic inspection and upkeep of masonry weirs, tanks, reservoirs and appurtenant works needs to be laid down, so that timely repairs are carried out.

(Paras 2.12 and 5.3).

II. With a view to improve agro-economic return per acre inch of water, it seems necessary to examine the possibilities of extending commands on a number of irrigation works, which are using their scarce supplies lavishly. That will, in its turn, lead to a change in the cropping pattern designed to give optimum agricultural production per unit of water, as well as land.

(Paras 2.13, 2.15, 2.17, 2.35 and 2.56)

III. Outletting on irrigation channels should be done on a rationalised and scientific basis, in the interest of equitable distribution of supplies.

(Paras 2.26, 2.27, 2.34, 2.39, 2.40, 2.44, 2.50, 2.55, 2.65, 2.78, 2.86, 2.93 and 2.96).

IV. Continuous running of channels should be changed over to intermittent running, subject to systematic regulation of supplies and rostering of channels and outlets, so that scarce resources of water are subjected to optimum use and chances of wastage are minimised.

(Paras 2.34, 2.39, 2.40, 2.44, 2.50, 2.55, 2.65, 2.78, 2.85 and 2.93).

V. Construction of off-taking channels and water courses should proceed side by side with the construction of reservoirs and their allied works. Delays in completion of irrigation channels cause valuable storage water to remain unutilised, besides unnecessary locking up of the capital.

(Paras 2.20, 2.45 and 2.70).

VI. Dual control exercised on tanks and reservoirs irrigating from 51 to 2,500 acres does not seem to lead to optimum utilisation of irrigation supplies. A reconsideration of the issue seems necessary in the light of experience gained during the past two years.

(Paras 2.22, 2.23, 3.12 and 5.14).

VII. Annual water budgets for *pucca* compact irrigation schemes, like the tank at Siliserh in Alwar, need to be drawn up so that the supplies are subjected to maximum possible use for agricultural production.

(Paras 2.25, 2.29 and 2.34).

VIII. Unauthorised acts of people leading to wastage of water need to be controlled through punitive action. Wherever possible equitable distribution and economic use of water need to be encouraged through introduction of *Warabandi* and *Osrabandi*.

(Paras 2.40, 2.50, 3.11 and 5.11).

IX. Agricultural demonstration farms preferably in the cultivators' fields, need to be established in the commands of selected irrigation schemes with a view to evolve new cropping patterns depending on irrigation facility available.

(Paras 2.50, 2.86, 2.94 and 5.13).

X. Where '*Chahi*' areas interpolate the commands of irrigation works, such commands need to be extended, with a view to ensure improvement in their irrigation efficiency.

(Paras 2.58 and 2.60).

XI. Soil suitability needs to be ascertained before schemes of submergence *bunds* are taken up so that they do not fail to retain water.

(Paras 3.8 and 3.22).

XII. The system of assessment for submergence irrigation appears to be different on different works. It needs to be rationalised and brought on a uniform basis.

(Para 3.10).

XIII. Drilling of shallow tubewells in the beds of submergence tanks, wherever feasible and practicable, may be encouraged. They could be helpful for subsequent *rabi* waterings.

(Para 3.17).

XIV. Watercourses generally do not exist for irrigation from tanks and channels, thus causing lot of wastage. Action needs to be caused for their construction either on self-help basis or through organizational set-ups like *Panchayats* or through suitable legislative action.

(Paras 2.50, 3.14 and 5.10).

XV. Possibility of imposing some annual cess on the wells benefited by *Rapats* built by the State need to be looked into.

(Para 4.10).

XVI. Feasibility of constructing *Rapats* without the use of mortar needs also to be considered.

(Paras 4.9, 4.10 and 4.11).

XVII. Indiscreet expansion of *Rapats* needs to be guarded against and resisted in the interest of areas in lower reaches of the *Nadis* concerned.

(Para 4.36).

XVIII. In areas where suitable subsoil resources exist people may be encouraged to have more open wells by grant of *taccavi* loans and subsidies.
(Paras 4.19, 4.20 and 4.23).

XIX. Replacement of *Charsa* by iron persian wheels needs to be encouraged. Possibility of lifting water by windmills may also be explored.
(Paras 4.19 and 4.32).

XX. Further exploration of underground water resource may be carried out in Luni river basin to locate any other rich water yielding site like that at Bourunda.
(Paras 4.31, 4.32 and 5.8).

XXI. The deep tubewell exploratory borings like those in Rajakhera area should be put into commission without delay, so that the results of their working could be examined and more tubewells could be planned.
(Paras 4.34 and 5.8).

XXII. To reduce heavy evaporation losses from tanks in the arid and semi-arid regions of the State, field use of monomolecular compound like cetyl-alcohol needs to be tried.
(Para 5.5).

XXIII. It may be worthwhile making rainmaking experiments in suitable locations e.g. Mount Abu, so as to examine possibilities of augmenting natural precipitation wherever possible.
(Para. 5.7).

XXIV. Land capabilities surveys need to be carried out in all such areas as have the benefit of irrigation of one kind or the other, so that cropping patterns leading to optimum agricultural production could be worked out.
(Para 5.12).

XXV. To evolve uniform pattern of irrigation rates in the State, the existing rate structure needs to be examined by an expert body or a specific irrigation rates Commission.
(Para 5.9).

XXVI. In areas subjected to erosion of soils either by rain or wind, steps need to be taken for conservation of soils—more particularly in irrigated areas.
(Para 5.15).



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APPENDIX I

TERMS OF REFERENCE

The Minor irrigation projects may be divided for study into two parts:—

- (a) Works already in existence.
- (b) Works which are now being constructed.

2. Case studies should be made of a number of projects of each type under the above headings with a view to judging their efficiency having regard to the objects with which such works were carried out.

3. The following points should be especially borne in mind:—

Existing Projects

- (i) The present state of repair and maintenance.
- (ii) The system of keeping works in proper maintenance with particular reference to the customary obligations of villagers for keeping such works in a sound condition from year to year, the Team should also examine the extent to which these obligations are enforced, the reasons for the failure to do so and the steps that should be taken to carry out such obligations efficiently.
- (iii) Reasons, if any, for non-utilisation of water by cultivators.
- (iv) Improvements necessary to make the projects more efficient either in the matter of better agricultural planning and practices or in respect of engineering works.
- (v) Cost of restoration if the project is in a state of disrepair and whether it has been included in the Plan.

New Projects

- (i) Method of selection—procedure and principles on which priorities are based.
- (ii) Flow Chart of the construction Project should be prepared to examine whether any avoidable delay has occurred in its completion.
- (iii) Whether fullest use is made of catchment capacity in preparing designs.
- (iv) Economics of design.
- (v) State of agricultural planning with a view to optimum utilisation of benefits.
- (vi) Institutional arrangements provided for the proper maintenance of new works with special reference to the customary obligation of villagers in this regard.
- (vii) Costs of actual construction compared to estimated costs—the reasons for increase if any and the care with which the initial estimates were framed.

4. Any other matter which the Team considers necessary to report upon having a bearing on economy and efficiency of such projects.

5. The following information should be gathered by the Team for each State, taken as a whole in regard to existing minor irrigation works:—

- (i) The total area irrigated from them according to Settlement registers.
- (ii) The area actually irrigated from year to year beginning from 1947.
- (iii) The reason for the reduction, if any, in the area irrigated.

6. In addition, the Team will carry out a study of the tubewell schemes of the Punjab and the U.P. with reference to the fact whether optimum use has been made of the facilities available by ensuring scientific crop planning and by improving agricultural practices. The study should be based on an examination of individual tubewells, which may be divided into most successful, successful and least successful varieties for the purpose of study. The Team should also select a few tubewells for which alternative crop planning and practices may be recommended that are being carried out at present in order to make them more successful. The consideration mentioned regarding minor irrigation works in paragraph 3 *mutatis mutandis* be taken into consideration for the study of tubewells also.



APPENDIX II

Minutes of a meeting held at the residence of Shri Nathu Ram Mirdha, Minister for Agriculture and Irrigation Projects on September 23, 1963 at Jaipur

Government of Rajasthan

1. Sh. N. R. Mirdha,
Minister for Agriculture
and Irrigation, Rajasthan.
2. Ch. Hari Singh,
Chief Engineer, Irrigation,
Rajasthan.
3. Sh. T. C. Kalia,
Director, Agriculture,
Rajasthan.

Committee on Plan Projects

1. Sh. M. Thirumala Rao, M.P.,
Leader, Irrigation Team.
2. Shri Baleshwar Nath,
Member, Irrigation Team.
3. Dr. Arjan Singh,
Member, Irrigation Team.
4. Sh. Mahavir Prasad,
Member, *ex-officio*,
Irrigation Team.

IN ATTENDANCE

1. Sh. A. P. Singhal,
Executive Engineer,
Rajasthan.
2. Shri P. C. Kalia,
Engineer, Irrigation Team.
3. Shri R. S. Singh,
Research Officer, Irrigation
Team.
4. Shri R. P. Bhatnagar,
Economic Investigator, Irriga-
tion Team.

Initiating the discussion, the Leader Shri Thirumala Rao stated that Irrigation Team intended taking up the study of different types of minor irrigation works existing in the State, with a view to judging their techno-economic efficiency in achieving the objectives initially set for such works.

On the question of the under-ground water in the State the Minister for Agriculture pointed out that there is a good resource of under-ground water supply at Bourunda, a place about 50 miles from Jodhpur where sub-soil water supply is available. He stated that there were 5-6 wells (open) fitted with electric pumps. One of these wells, he stated, was yielding as much as 2,00,000 gallons of water per hour, from a depth of about 125 feet.

Member Shri Baleshwar Nath at this stage suggested that where the source was so rich, as well as continuous supply being available throughout the year, why should water be taken from Jawai Project for water supply in the town, instead of from such wells.

Shri Mirdha, Minister for Agriculture, welcomed the suggestion and said that it was worth examining. He told the Chief Engineer, Ch. Hari Singh to look into it.

Discussing the under-ground resources of the State, the Minister stressed the need for examination of the schemes for State tube-wells that are being planned by the State authorities in different regions of the State, where there was possibility of getting under-ground water supply.

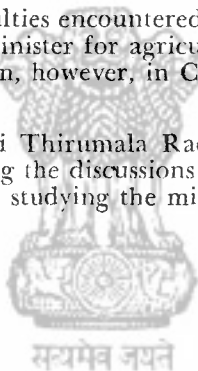
On the question of fixing electricity rates Shri Mirdha said that the present rate of -/2/- annas was not conducive to the agricultural growth in the tube-well areas. Shri Mahavir Prasad said that it should be 9 paise per unit, as per decision taken in Minor Irrigation Conference.

Member, Shri Baleshwar Nath pointed out that it will be advantageous to have State tube-well projects including the construction of *pucca* water channels in the scheme, otherwise there will remain a lag between the utilization of the potential created. He also stated that a thorough study of under-ground water potential should be undertaken before tapping this resource.

Shri Mahavir Prasad said that *rapats* and *gulli* plugging for enriching the sub-soil are necessary. They should be provided wherever there is a possibility of it.

On the question of difficulties encountered in the construction of water channels in Rajasthan, the Minister for agriculture said that in most parts of the State it was no problem, however, in Chambal area progress is now being made.

Leader of the Team Shri Thirumala Rao, thanked the Minister and State Authorities for arranging the discussions and the facilities they would be providing to the Team for studying the minor irrigation projects in the State.



APPENDIX III

Minutes of a meeting held at Circuit House, Udaipur on September 24, 1963

PRESENT

Government of Rajasthan

1. Shri Bhika Bhai,
Minister for Minor
Irrigation and Forest,
Rajasthan.
2. Ch. Hari Singh,
Chief Engineer,
Irrigation, Rajasthan.

Committee on Plan Projects

1. Sh. M. Thirumala Rao, M.P.,
Leader, Irrigation Team.
2. Sh. Baleshwar Nath,
Member, Irrigation Team.
3. Dr. Arjan Singh,
Member, Irrigation Team.
4. Sh. Mahavir Prasad,
Member, *ex-officio*,
Irrigation Team.

IN ATTENDANCE

- | | |
|--|--|
| 1. Shri A. P. Singhal,
Executive Engineer, Rajasthan. | 3. Shri R. S. Singh,
Research Officer, Irrigation
Team. |
| 2. Shri P. C. Kalia,
Engineer, Irrigation Team. | 4. Shri R. P. Bhatnagar,
Economic Investigator, Irriga-
tion Team. |

After welcoming the Leader and members of the Team at Udaipur the Minister, Shri Bhika Bhai stated that there was great scope for extension of minor irrigation works in Udaipur region. Shri Baleshwar Nath, Member enquired if submergence tanks as are in use in Bharatpur area could be extended to Udaipur area also. Since rainfall in this area is heavier, it was felt that regular irrigation tanks seemed more feasible in Udaipur region.

2. Another point raised by the Team was regarding change that has taken place recently in respect of control and assessment of water rates on irrigation works irrigating less than 2,500 acres. It was felt by the Team that efficiency lies in the fullest utilisation of the water resources as become available year after year. This requires an engineering control. As such, the old practice of assessment through irrigation authorities seemed to need no change. In fact, efficiency of irrigation officers is, by and large, judged by the amount of assessment bill, season after season.

3. It was also felt by the Team Members that the system of *Warabandi* or *Osrabandi* as practised in the Punjab and Uttar Pradesh should be introduced wherever necessary. This will inculcate a feeling of right on water use and its subsequent utilisation among the irrigators.

The Minister, Shri Bhika Bhai also accompanied the Team on a visit to Udaisagar and Bhopal sagar tanks.

APPENDIX IV

Copy of the letter from Sh. Baleshwar Nath, Member, Irrigation Team to Sh. Kishori Lal, C.E. Irrigation, Rajasthan on artificial rain making experiments.

Baleshwar Nath,
Member, M.I.T.

D.O. No COPP/B/MIT/469
2, Maulana Azad Road,
New Delhi.

August 24, 1962.

My Dear Kishori Lal ji

Besides thanking you for the consideration shown to us during our recent visit to Jaipur, I am writing this as a Member of the Advisory Committee of the Rain and Cloud Physics Research Unit of the Council of Scientific and Industrial Research, New Delhi.

While going through the data of Jawai Project supplied by you, I feel it is worthwhile giving trial to experiment on artificial rain making in the Jawai area. The subject of artificial rainfall is still very much in an experimental stage, and the experiments conducted so far in the different parts of the world have not yet given results, which may be treated as conclusive. It is, therefore, not possible to foresee the results of the experiments. But, on considerations generally of the location of the area near Mount Abu, which may provide a suitable venue for carrying out such trial, I feel I may venture to suggest such experimentation being done on that site. The results may be indeterminate or even negative, because factors governing natural precipitation are too numerous. Experiments seek only stimulation of some natural process, and have to follow, by and large, a pattern of hit or miss operation.

I am conveying this to you for the consideration of the authorities at your end, so that Rajasthan Government may like to formulate a scheme for experimentation in that area. The know-how of the experimentation is available with the Rain and Cloud Physics Research Unit of National Physical Laboratory, New Delhi-12, who are themselves conducting experiments at three stations *viz.* Delhi, Agra and Jaipur.

Madras State are also carrying out such operations in eastern slopes of Western Ghats for a couple of years, and are establishing a new experimental station at Trichuri in Madras State. For your information, I am enclosing herewith a copy of a report of the Superintending Engineer In-charge of this Trichuri Project. This might give you an idea as to the work involved in such trials and experiments.

In my opinion it is worthwhile trying these experiments. If they succeed they may open up possibilities of increasing precipitation in this scarcity area in Rajasthan.

With kind regards,

Yours sincerely,

BALESHWAR NATH

Shri Kishori Lal,
Chief Engineer, Irrigation Department,
Rajasthan Government, JAIPUR.

APPENDIX V

Schedule of water rates on irrigation in force in Rajasthan

SCHEDULE II*

(Vide Rule 22)

OCCUPIERS RATES

PART I

GENERAL PROVISIONS

1. *Commencement*—The rates provided in this Schedule shall come in force from the *Rabi* crop of 1958-59.

2. *Meaning of spices*—Spices and oil-seeds mentioned in this schedule include the crops of *Dhaniya*, *Methi*, *Haldi*, *Chillies*, *Sonf*, *Zeera*, *Ajwan*, *Groundnuts*, *Alsi*, *Sarson*, *Tarameera* and *Dyes*.

3. *Meaning of old tank*—Old tank means a water reservoir constructed prior to the 1st January, 1952.

Provided that if such a tank:—

- (a) was not in use and has been restored on or after the 1st January, 1952; or
- (b) has received repairs on or after the 1st January, 1952 and its irrigated area before repairs was less than 10 per cent of the total area irrigated after repairs, it shall be deemed to be a tank made after the 1st January, 1952 for the purpose of this Schedule.

4. *Resumed Jagir tanks*—Areas irrigated from *Jagir* tanks resumed under the Rajasthan Land Reforms and Resumption of *Jagirs* Act, 1952, shall be assessed at the rates provided in this Schedule.

5. *Concessions discontinued*—Concessions or *muafis*, if any in irrigation charges enjoyed heretofore, shall be discontinued, unless the Collector, after hearing any person objecting to such discontinuance, and in consultation with the Executive Engineer, Irrigation concerned, decides otherwise.

6. *Charges in case of fall in water below sluice level*—Where the irrigation charges are levied on the basis of crops and if the water level in a tank is below sluice level on the 15th February, then, on lands which have received not less than three waterings, rates as provided in this Schedule shall be charged; and on lands which have received waterings less than three, the said rates shall be reduced by one-third in case of two waterings, and two third in case of one watering.

7. *Lift or seepage irrigation*—Where irrigation is by lift or seepage, half the rates provided in this Schedule shall be charged.

NOTE—(1) * Amendment made vide Irrigation Department Notification, Jaipur December 11, 1958 No. F. 3 (12) Irg/53/Pt. II.

(2) † Added vide amendment No. F. 3(12) Irg/53. Pt. II, dated 17-2-1959.

PART II

Rates per acre per crop for water of the Ganganagar Project

Name of crop					Per acre
					Rs.
(a) Irrigation under Perennial Channels					
1. Sugarcane	..	..	..	..	16.25
2. Rice	..	..	..	..	8.50
3. Water Nuts	..	..	..	..	9.75
4. Cotton*	..	..	..	..	7.25
5. Indigo and other dyes, tobacco, spices and drugs, orchards, vegetables other than turnips except Zeera†	..	..	..	..	6.75
6. Gardens	..	..	..	..	8.25
7. Wheat	..	..	..	..	5.25
8. Melons, and all other <i>Kharif</i> crops not otherwise specified, maize, fibres other than cotton, barley, oats, <i>Bajra</i> and <i>Gauwa</i>	..	..	..	..	6.00
9. Oilseeds and all other <i>Rabi</i> crops not otherwise specified	..	..	..	..	5.25
10. <i>Bajra</i> , <i>Jowar</i> and Pulses	..	..	..	..	4.00
11. <i>Gauwa</i> , Fodder crops, Cheena, and Gram with two and more waterings	..	..	..	..	4.00
12. Watering for ploughing not followed by a crop (<i>Palwa</i>) and grass single watering	..	..	..	..	1.50
13. Zeera†	..	..	..	..	7.75
(b) Non-Perennial Channels					
1. All <i>kharif</i> crops	..	..	..	..	Same rates as for perennial channels.
2. All <i>Rabi</i> crops					
(1) First Watering	..	..	..	..	3.00
(2) Second Watering	..	..	..	..	3.00
(3) Third or more waterings	..	..	..	..	Same rates as for perennial channels.
(4) Watering for Ploughing not followed by a crop (<i>Palwa</i>)	..	..	..	..	1.50

NOTES— (1) * Rates for cotton raised from Rs. 6.25 to Rs. 7.25 *vide* amendment No. F 4(28) Irg/58 dated 22-9-60.

(2) † Words "except zeera" and item No. 13 added *vide* amendment No. F. 4(28) Irg/58 dated 2-4-1959.

PART III

Rates per acre per crop in Bhakra Project and Ghaggar Canal areas

Name of crop					Per acre
(a) Perennial Irrigation					Rs.
Sugarcane	..	..	..	..	16.50
Rice	..	..	..	..	9.00
Wheat	..	..	..	..	6.00
Barley	..	..	..	..	6.00
Gram	..	..	..	..	5.00
Maize	..	..	..	..	6.50
Cotton*	..	..	..	..	7.75
Jowar, Gourd and other Fodder crops	..	..	..	..	4.00
Vegetables and spices except Zeera†	..	..	..	..	8.25
Zeera†	..	..	..	..	9.25
Gardens	..	..	..	..	8.25
Sahamp and grass	..	..	..	..	4.00
All other crops <i>khurif</i>	..	..	..	..	6.37
<i>Rabi</i> oil crops	..	..	..	..	6.37
(b) Non-perennial Irrigation					
1. For <i>khurif</i> crops	..	..	..	..	Same rates as that of perennial irrigation.
2. For <i>rabi</i> crops					
(i) First watering	..	..	..	..	3.00
(ii) Second watering	..	..	..	..	3.00
(iii) Third watering	..	..	..	..	Same as that of perennial irrigation.
3. For irrigation water taken for ploughing and not followed by any crop					
(i) For First watering	..	..	..	..	3.00
(ii) For second watering	..	..	..	..	3.00
(iii) For third watering	..	..	..	..	Same as that of perennial irrigation.

NOTES—(1) * Rates of cotton raised from Rs. 6.75 to Rs. 7.75 *vide* amendment No. F. 4(28) Irg/58 dated 22-9-1960.

(2) † Words "except Zeera" and a new item "Zeera" added *vide* amendment No. F. 4(28) Irg/58 dated 2-4-1959.

PART III-A*

Rates per acre per crop in Rajasthan Canal area

(Non-perennial Irrigation)

Name of crop	per acre
	Rs.
I. For Kharif Crops	
1. Sugarcane	16.50
2. Rice	9.00
3. Maize†	6.50
4. Cotton‡	7.75
5. Jowar, Gouar and other Fodder crops†	4.00
6. Vegetables and spices except Zeera†	8.25
7. Garden†	8.25
8. Sanhemp and grass†	4.00
9. All other kharif crops†	6.37
II. For Rabi Crops	
(a) First Watering	3.00
(b) Second Watering	3.00
(c) Third Watering	Same as that of perennial Irrigation in Bhakra area.

NOTES—

- (1) * Added *vide* amendment No. F. 4(10) RCPD/61 dated Jaipur Oct. 9, 1961.
- (2) ‡ Rates of cotton raised from Rs. 6.75 to Rs. 7.75 *vide* amendment No. F 4(10) RCPD/61 dated 12-3-1962.
- (3) † Item No. 3 to 9 substituted from original item No. 6 to 13, deleting item Nos. 3, 4, 5 and 12 for Wheat, Barley, Gram and Zeera, *vide* amendment No. F. 4(10) RCPD/61 dated 12-3-1962.

PART IV

Rates chargeable on all Irrigation done from (a) all works which have been constructed after the 1st January 1952 other than from Gang Canal, Bhakra and Rajasthan Canal() supplies, and (b) from all works in the area of the former States of Banswara, Dungarpur and Pratapgarh*

Name of crop				Rates per acre
				Rs.
1. Sugarcane	..	..	..	22.00 Per year
2. Vegetable Singhara	..	..	..	12.00 Per crop
3. Garden	..	..	..	12.00 Per year
4. Lucern, Tobacco and Poppy	..	..	..	10.00 Per crop
5. Rice	..	..	..	8.50 Per crop
6. All other crops except Zeera and Cotton (**)	..	..	..	7.00 Per crop
7. Palewa not followed by crop	..	..	..	4.00 for all crops
8. Wheat†	..	..	..	10.00 Per crop
9. Zeera(**)	..	..	..	8.00 Per crop
10. Cotton (**)	..	..	..	8.00 Per crop

NOTES—

- (*) Added *vide* No. F. 4(10) RCPD/61 dated 9-10-61.
- (**) Words "except Zeera" and "Cotton" and a new Item Zeera and Cotton added *vide* amendment No. F. 4(28) Irg/58 dated 2-4-59 and F. 4(28) Irg/58 dated 22-9-1960.
- † Added *vide* amendment No. F. 3(12) Irg/53 Pt. II dated 17-2-1959.
- ‡ Words "Per Crop" substituted in place of the words "Per Year" *vide* amendment No. D. 3936/F.3(12) Irg/53 Pt. II dated 4-8-1959.
- Government *vide* Order No. F. 7(111) Irg/56 dated 22-1-1963 have fixed the following rates for irrigation under the Chambal Project area during the 3rd Plan period *i.e.* 31-3-1966 :—

				Rs.
Linseed and <i>Dhania</i>	..	..	..	4.00 Per acre
Gram	..	..	..	5.00 Per acre
Cotton	..	..	..	3.00 Per acre

PART

Rates (per acre) in respect of old Tanks of the

Serial No.	Name of crop	Chain 165 ft.	Chain 150 ft.	Areas of the former State of Alwar except Bundh Sifiserh and Sairabi, Izadi Dheri Areas	Chain 132 ft.	
		Areas of the former State of Karauli	Areas of the former State of Dholpur		Tank Baretha of Bharatpur and areas of former Bundi & 1st class lands of former Ajmer	Areas of former State of Kishangarh except former Tehsil Sarwar
1	2	3	4	5	6	7
1	Sugarcane ..	14.50	15.00	16.00	16.00	16.00
2	Garden, Pan ..	12.00	10.00	12.16	12.00	12.00
3	Vegetable and Singhara	12.00	10.00	12.16	12.00	12.00
4	Lucern, Tobacco and Poppy	10.00	10.00	9.92	10.00	10.00
5	Rice ..	8.50	8.75	8.64	8.50	8.50
6	Spices and Oilseeds except Zeera*.	7.00	7.00	7.04	7.00	4.00 for first and 7.00 for more than one watering.
7	Wheat, Barley, Gajra, Gochani, and Bejar	10.00 for Bhimsagar and 9.25 for other tanks	10.00	7.68	7.50	4.00 for 1st watering and 7.50 for more than one watering.
8	Maize & Gram ..	7.00	7.00	7.00	7.00	4.00 for 1st watering & 7.00 for more than one watering.
9	Bajra, Jowar, Til, Moth, Guar, Pulses, Fodder, and other crops	7.00	7.00	5.12	5.00	2.50 for 1st watering & 5.00 for more than one watering.
10	Pulses not followed by a crop.	4.00	2.30	2.88	3.00	2.88 3.00
11	Zeera ..	8.00	8.00	8.25	8.00	5.00 for 1st watering & 8.00 for more than one watering.
12	Cotton† ..	8.00	8.00	8.00	8.00	5.00 for 1st watering & 8.00 for more than one watering.

Note :—(1) * Words "except Zeera" and Item 11 added vide amendment No. F 4(28)/Irg. 58 dated

V (A)

areas of the former States named below

Chain 165 ft. Areas of the former States of Jaipur and Jhalawar	Chain 16½ ft Areas of the former State of Udaipur	Chain 132 ft. Areas of the former Tehsil Sarwar State of Kishangarh	Chain 165 ft. Areas of the former State of Shah- pura & Tonk	Chain 132 ft. Areas of the former state of Kota	Remarks
8	9	10	11	12	13
16-00	16-12	16-00	12-16	12-00	Per year
12-16	12-00	12-00	8-96	9-00	Per Year
12-16	12-00	12-00	8-96	9-00	Per Crop
9-92	10-12	10-00	8-00	8-00	Per year
8-64	8-62	8-50	7-68	7-50	Do.
3-20 for 1st water- ing and 1-92 for more than one watering.	7-12	2-50 for 1st water- ing & 7-00 for more than one watering.	3-84	2-00 for 1st water- ing & 4-00 for more than one watering.	
2-86 for 1st water- ing and 1-60 for more than one watering.	6-00	2-00 for 1st water- ing & 6-00 for more than one watering.	3-84	2-00 for 1st water- ing & 4-00 for more than one watering.	Do.
2-88 for 1st water- ing and 1-60 for more than one watering.	5-25	2-00 for 1st water- ing & 5-50 for more than one watering.	3-20	2-00 for 1st water- ing & 3-50 for more than one watering.	Do.
2-50 for 1st water- ing and 1-28 for more than one watering.	5-25	2-00 for 1st water- ing & 5-00 for more than one watering.	2-88	2-00 for 1st water- ing & 3-00 for more than one watering.	Do.
3-00	2-84	3-00	2-00	1-92	2-00
4-20 for 1st water- ing and 2-92 for more than one watering.	8-12	3-50 for 1st water- ing & 8-00 for more than one watering.	4-84	3-00 for 1st water- ing & 5-00 for more than one watering.	Do.
3-84 for 1st water- ing and 2-56 for every sub- sequent water- ing.	6-30	3-00 for 1st water- ing and 6-50 for more than one watering.	4-30	3-00 for 1st water- ing & 4-50 for more than one watering.	Do.

PART

Rates (Per Bigha) in respect of old Tanks of the

Serial No.	Name of crop	Chain 165 ft.	Chain 132 ft.	
		Areas of the former State of Alwar except Bund Siliserh and Sairabi and Izadi Dehri Areas	Tank Baretha of Bharatpur & areas of former Bundi and first class tanks of Ajmer	Areas of former States of Jodhpur, Sirohi and Kishangarh except Tehsil Sarwar
1	2	3	4	5
1	Sugarcane ..	10.00	6.40	6.40
2	Garden Pan (Betals) ..	7.60	4.80	4.80
3	Vegetable and Singhara ..	7.60	4.80	4.80
4	Lucern, Tobacco and Poppy ..	6.20	4.00	4.00
5	Rice ..	5.40	3.40	3.40
6	Spices and Oilseeds except Zeera*	4.40	2.80	1.60 for 1st watering and 2.80 for more than one watering.
7	Wheat, Barley, <i>Gujra</i> , <i>Gochani</i> and <i>Bejar</i>	4.80	3.00	1.60 for 1st and 3.00 for more than one watering.
8	Maize and Gram ..	4.40	2.80	1.60 for 1st and 2.80 for more than one watering.
9	<i>Bajra</i> , <i>Gowar</i> , <i>Til</i> , <i>Moth</i> , Pulses, Podder and other crops.	3.20	2.00	1.00 for 1st and 2.00 for more than one watering.
10	Palewa not followed by crop ..	1.80	1.20	1.20
11	Zeera* ..	5.40	3.80	2.60 for 1st watering and 3.80 for more than one watering.
12	Cotton† ..	5.00	3.20	2.00 for 1st watering and 3.20 for more than one watering.

Note.—* Words "except zeera" and

† Item 12 added *vide* amendment

V (B)

areas of the former States named below

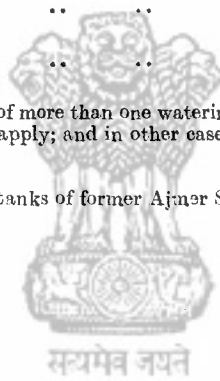
Chain 165 ft.	Chain 152½ ft.	Chain 132 ft.	Chain 165 ft.	Chain 132 ft.	Remarks
Areas of the former State of Jaipur and Jhalawar	Areas of the former States of Udaipur	Areas of the former Tehsil Sarwar of Kishangarb of State	Areas former States of Shahpura and Tonk	Areas of former State of Kota	
6	7	8	9	10	11
10.00	8.60	6.40	7.60	4.80	Per year
7.60	6.40	4.80	5.60	3.60	Per half year
7.60	6.40	4.80	5.60	3.60	Per crop
6.20	5.40	4.00	5.60	3.20	Per year
5.40	4.60	3.40	4.80	3.00	Per year
2.00 for 1st watering and 1.20 for every additional watering.	3.80	1.00 for 1st watering and 2.80 for more than one watering.	2.40	0.80 for 1st and 1.60 for more than one watering.	
1.80 for 1st and 1.00 for every additional watering.	3.20	0.80 for 1st and 2.40 for more than one watering.	2.40	0.80 for 1st and 1.60 for more than one watering.	
1.80 for 1st and 1.00 for every additional watering.	2.80	0.80 for 1st and 2.20 for more than one watering.	2.00	0.80 for 1st and 1.40 for more than one watering.	
1.60 for 1st and 0.80 for every additional watering.	2.80	0.80 for 1st and 2.00 for more than one watering.	1.80	0.80 for 1st and 1.20 for more than one watering.	
1.80	1.60	0.80	1.20	0.80	
3.00 for 1st and 2.20 for every additional watering.	4.80	2.00 for 1st watering and 3.80 for more than one watering.	3.40	1.80 for 1st and 2.60 for more than one watering.	Per Year
2.40 for 1st and 1.60 for every additional watering.	3.40	1.20 for 1st and 2.60 for more than one watering.	2.60	1.20 for 1st and 1.80 for more than one watering.	Per year

item 11 added *vide* amendment No. F. 4(28)/Irg./58 dt. 2-4-59.

No. F. 4(28) Irg./58 dt. 22-9-60.

(a) Rates on Sairabi and other Special Areas under old Tanks

Particulars	Rates
	Rs.
1. Rates on Bundh Siliserh (Alwar).	
(a) Within Municipal limits of Alwar City	6.50 per acre per watering.
(b) Upto 3 miles of the Bundh	5.00 Do.
(c) From the Utrada Lockage	4.00 Do.
2. Rates on Sairabi and Izadi Dehri areas of former Alwar State:—	
(a) Sairabi	3.20 Per acre
(b) Izadi Dehri	2.40 Per acre
3. Rates on Sairabi areas of former State of Bharatpur:—	
(a) Sairabi Mutwatir	3.00 Per acre or 1.20 per bigha.
(b) Sairabi Ekbara	1.50 Per acre or 0.60 per bigha.
(c) On Tank Sikri Bund in case of more than one watering by flow, rates of Baretha Tank will apply; and in other cases the above Sairabi rates will apply.	
4. *Rates on second class Irrigation tanks of former Ajmer State ..	Prevailing rates raised by 50%.



By Order of the Governor,

Z. S. JHALA,

Secretary to the Government.

APPENDIX VI

Copy of letter No. F. 4(13)Irg/65, dated the 16th October 1965 from Deputy Secretary to the Government of Rajasthan, Irrigation Department, to Shri Baleshwar Nath, Member, Irrigation Team, Committee on Plan Projects, concurring with recommendations of the Draft Report of the Team on the study of minor irrigation works.

SUBJECT:—*Team for the study of Minor Irrigation Works.*

REFERENCE:—*Your letter No. COPP/IT/M/65/1956, dated the 24th March, 1965.*

The Government have examined the draft report of the Irrigation Team on Minor Irrigation Works in Rajasthan and appreciate the work done by the Team in such a short time.

The State Government is generally in agreement with all the recommendations of the Team and action is being taken to rectify and correct specific defects and short-comings noticed by the Team on individual works studied. Action will also be taken for removal of similar defects on other irrigation works as far as possible.

Some of the recommendations like increase in the commanded areas of the irrigation project, removal of dual control on irrigation works irrigating between 51 and 2,500 acres and a revision in the crop pattern encouraging greater cultivation of oil seeds, etc., on some of the works, involve policy matters of the Government. The views of the Team will be given due consideration while fixing the State policy in future.

